Can Information in Children's Drawings Inform Teachers' Practices? A Study of Singaporean Pre-school Teachers' "Reading" of 5-6 year olds' Drawings.

CHAN, KAM,CHEE,REBECCA

Rebecca Kam Chee, Chan

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Abstract

Children's drawings are graphic visual records of learning experiences (e.g. a zoo outing) often displayed on the walls of Singapore preschools to celebrate children's learning and teachers' teaching. At best, drawings are pictures to report to parents (e.g. child's colouring skills or impressions of learning). Drawings are under utilized as representations of learning and thinking to inform teachers' practices in lesson planning. First of all, a questionnaire survey with 325 teachers was collated to understand factors that influence teaching decisions. While face-to-face interviews with 61 children (5 - 6 years) had provided factors that influence their learning from children's perspectives. The study aimed to explore with the goal of developing a strategy to teach teachers to read children's drawings for information to support learning. As a result, the Bloom's taxonomy of educational objectives (TEO): cognitive processes (Anderson & Krathwohl, 2001) with a focus on learning and cognition was the framework for the "children's drawing evaluation checklist" designed to deduce information of content-knowledge and cognitive processes. About 140 teacher-respondents evaluated 50 pre-and post-lesson drawings on wild animals and the water cycle by 25 children (5 – 6 years old) from two preschools. The findings showed children's cognitive processes were directed at Bloom's "Remember," "Understand," "Apply," and "Analyze," capturing alongside rich information of children's spontaneous knowledge. The checklist was later revised and integrated with Biggs and Collis (1982) the Structure of Observed Learning Outcomes (SOLO) taxonomy to reflect the amount of information represented. The

revised checklist was tested with 18 mainstream teachers to evaluate wild animals and the water cycle drawings. To test for generalizability, the checklist was tested with 22 special needs teachers to evaluate 17 high functioning special needs children's (5- 6 years old) drawings. Consequently, implications of the use of information in children's drawings in this study are discussed.

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Rebecca Kam Chee, Chan

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Declaration

This thesis results entirely from my own work and has not been previously offered in candidature for any other degree or diploma.

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Dedication

This is dedicated to all children who draw to think and think to draw.

"An eye-opener.
There are more things than meets
the eye in terms of drawing."

(By a special needs teacher taught to read children's drawings in this study)

Chapter 1 The Research Context

1.1 The Investigator's Background

The investigator trains teachers on diploma and bachelor degree programmes in two leading institutions in Singapore. She teaches units on Art education, the psychology of children's drawings and Early Childhood education in child developmental psychology, visual arts and physical education. She also examines pre-and in-service teachers for practicum and final year projects. This study is a development of insights gained from her Masters dissertation on theoretical perspectives of young children's (2 to 6 years) representational strategies in drawing and observations of teachers' practices in the classrooms.

1.2 The Singapore Preschool Curriculum Background

For the benefit of the reader a brief summary of the early childhood approach in Singapore. The Singapore preschool curriculum framework guideline for 4 – 6 years old children developed by the Ministry of Education (MOE, 2003) consists of six dimensions of learning experiences 1. Aesthetics and creative expression; 2. Environmental awareness; 3. Language and literacy; 4. Motor skills development; 5. Numeracy; and 6. Self and social awareness. To translate these dimensions into classroom practices, most preschools in Singapore operationalized the six

dimensions into three different approaches (a fuller account is provided in Appendix A):

1. Thematic approach
    - E.g. Insects theme is integrated with the six dimensions (e.g. for Motor skills dimension - children to imitate the movements of insects. Language and literacy, children to learn the names and adjectives to describe insects).

2. Story-based approach
    - E.g. "The giving tree" by Shel Silverstein to teach concepts related to the six dimensions (e.g. Environmental awareness, teach concepts of trees and conservation)

3. Project approach
    - E.g. a hands-on approach of constructing "bridges" by studying the aesthetic and functions of bridges directed at Language and literacy, and Environmental awareness dimensions.

The investigation focuses on thematic approach in the study of "wild animals" and the "water cycle" drawings because it is an approach most familiar to many preschools and teachers in Singapore. Therefore, thematic drawings of wild animals fall under "Language and literacy" while the water cycle is under "Environmental awareness" (language arts and science) dimensions respectively and not purely from a science education perspective.

1.3 Research Motivation

The study is set within the Singapore context and is motivated by frequent observations of lessons inappropriately pitched and taught to pre-schoolers. The lessons were either pitched too simply teaching materials the children already very familiar or too challenging, overloaded with abstract concepts and lack extending children's thinking and learning. The investigator hypothesized that perhaps Singapore teachers lacked knowledge of other possible means for them to tap into children's prior knowledge to plan meaningful lessons. Most teachers were observed engaging children with teacher-directed question and answer (Q & A) at the beginning of a lesson (e.g. "children, what is this? Or "children can you tell me…") and proceed to delivering what they had pre-planned with little consideration of children's responses. This observation was corroborated by 325 teacher-respondents citing Q & A, the top preferred strategy to find out about children's sufficient/insufficient knowledge (discussed in Chapter 4). Most often, teachers and children were observed focus on "doing tasks rather than learning" (Black, et. al., 2006, p. 123) children are kept busy and active (e.g. answering questions or involved in an activity) but little learning as concept development is happening. Anderson & Krathwohl (2001) cautioned about the danger that "when the focus is placed on activities, students may be more interested in performing the activity than in learning from the activity" (p. 238). It is quite easy to be carried away providing concrete activities to provoke sensory experiences without challenging children's thinking and learning in preschool education. Newton (2012) suggested "it does not follow that engaging in practical work must lead to an understanding or to an understanding that is acceptable. It needs a teacher to monitor and shape the mental activity" (p.37). However, to monitor and shape mental activity requires teachers to understand what entails as criteria of thinking activity. This study proposed using Bloom's taxonomy of educational objectives (TEO), cognitive processes to help preschool teachers to read children's drawings for mental activity and information of children's spontaneous knowledge to inform teachers' practices, in particular, lesson planning. This study aimed to address a concern shared by Athey (1990) "early education needs to challenge children's thinking and extend their learning" (p. 41). This is summed up in Athey's comments:

> *A problem in early education is a lack of knowledge of spontaneous concepts that can guide the search for appropriate curriculum content….Mental representation cannot be studied directly but it can be construed from symbolic play, drawing, brick constructions and the like* (p.41 *(–) added*).

From my observation, Singapore teachers in general seemed to lack the know-how to access information of children's spontaneous concepts much less mental activity to inform curriculum content. Athey's idea that mental representation cannot be studied directly but through drawing is pertinent. Therefore, the investigator's hypothesized that perhaps, teachers need to be taught the skills to read children's drawings for information and ideas. To do this, requires a structured framework to facilitate teachers to read drawings objectively to elicit underlying thinking processes and content-knowledge.

Mindes (2007) suggested teachers do not always need to use the most complex method of assessing children. It is more efficient to use classroom-based activity because children often "learnt by imitation and are embedded in experience and action" (Black et.al. 2006, p.125). Thus, drawing is an experience-action-based activity and has long term sustainability because it is classroom-based and not separate from regular classroom teaching (Torrance, 2001). This is an important principle of consideration in informal assessment of young children to give us a meaningful picture of what a child knows and understands (Hein & Price, 1994). Therefore, the emphasis of this study is about *reading* children's drawings for understanding and information (knowledge) and not about "right-wrong judgments" in terms of achievement (Newton, 2012, p.109). My second motivation is to bridge the gap between many theoretical expositions of the excellence of children's drawings and classroom application for teachers to tap into a most unrecognized and underutilized source of information, children's drawings.

1.4 Research Value/Relevance

The study's research value lies in its real world practical application, contributing to learning relevant to children's prior knowledge, and teaching for professional enrichment gathering ideas from children's drawings (Qualter, 1996). It taps an under-utilized resource of information in children's spontaneous drawings, from activity children can engage in with minimum adult supervision. Value comes from using a developmentally age-appropriate activity to garner children's voices and perspectives at minimum cost of manpower, time and materials; to enrich curriculum planning and empower teachers and children as co-learners in the construction of knowledge. The study not only benefits children and teachers but parents as stake holders responsible for their children's learning and development because many children also make drawings at home. Most importantly, the study produces a framework, a drawing evaluation checklist to guide teachers and parents to read drawings for information of content-knowledge and thinking processes.

Figures 1.1 to 1.4 are examples of how a child's mental activity is construed from drawings and evaluated with the Bloom's TEO framework. They may seem to be nothing more than confounding "scribbles" to some adults but actually loaded with schematic interest and meanings. These are drawings of a two and a half years old girl exploring a mathematical concept of "length" in its vertical and horizontal sense.

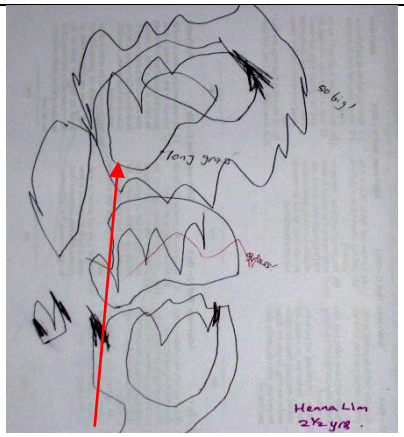


Figure 1.1 Long grass (jagged fat zig-zags)

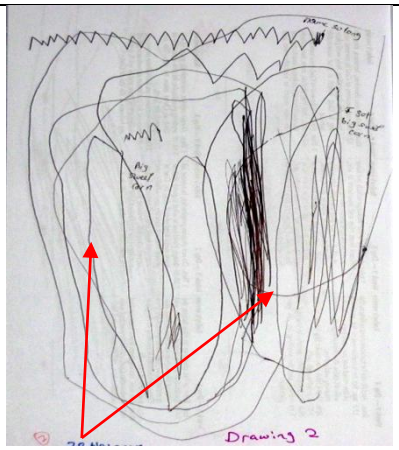


Figure 1.2 Big sweet corn

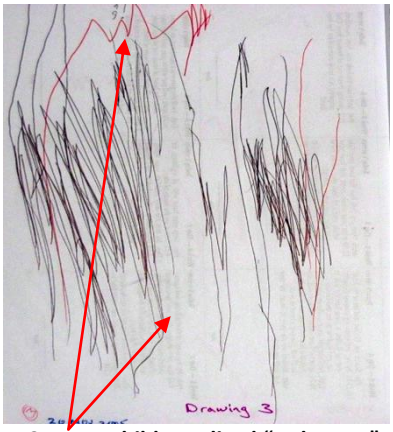


Figure 1.3 Long - child vocalized "so l..on..g" as she stretched a vertical line from top to bottom

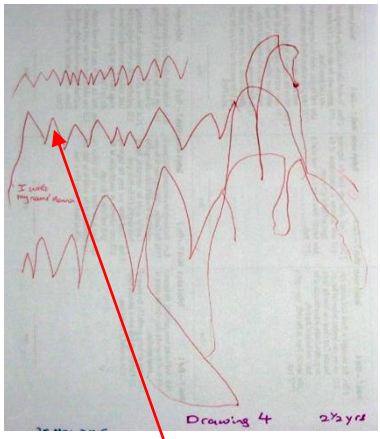


Figure 1. 4 My name - "I write my name Henna"

These drawings evaluated with the proposed Bloom's TEO framework (see Appendix A1) captured remembering process indicating a child's ability to recall and recognition by identifying and labeling long items, such as "*long grass;" "big sweet corn;" a "long line;" and "long name.*" It also indicated processes of "Understand," interpret by giving examples of different long items; classifying concepts of "long-ness" in a series of four different drawings; analyze by differentiating between a big sweet corn from long grass and a long name; and organizing concepts and things of varying lengths collectively. In other words, the framework helped to make visible mental processes and knowledge content embedded in drawings. (_ Bloom's TEO cognitive processes).

Values also lies in promoting teaching for understanding (Newton, 2012) by building on children's schematic interests or patterns of thought, (Athey, 2007; Meade & Cubey, 2008). There is also research value in making learning relevant and meaningful to children with information deduced from drawings (Hope, 2008; Meade & Cubey, 2008; Newton, D, 1999; Goswami, 1991, 1998; Wells, 1986; Vygotsky, 1978; Piaget, 1967;). This has impact on a child's motivation to learn and be a life-long learner (Wells, 1986). The value of using a common activity to create value in teaching and learning cannot be overemphasized. Finally, it introduces an innovative pedagogical practice to enrich teachers professionally to see things with a fresh eye, from children's perspectives.

1.5 Research Uniqueness

The research uniqueness lies in its ability to bridge the gap between theory and practice by developing a Bloom's TEO (Anderson & Krathwohl, 2001) children's drawing evaluation checklist teachers can use to evaluate drawings from a developmental perspective (see Chapter 8). It was later revised by integrating Biggs & Collis (1982) Structure of Observed Learning Outcomes (SOLO) for response rating on the amount of information indicated for each cognitive criterion. To date, there is a lack of guidance for teachers and parents to read children's drawings for information besides those used for psychological projective personality testing e.g. The Draw-A-Person Test (DAP test, or Goodenough-Harris Draw-A-Person Test, [1926]), meant only for trained experts. In addition, reading information from children's drawing for curriculum planning is a unique concept to most educators because they "*do not know what to look out for*" a claim made by some teacher-respondents (See Chapters 4 and 8) prior to the introduction of the study's framework. This study is unique because it seems to be the first to explore how teachers and parents can be *taught* to read children's drawings and counter the misconception that only art therapists or trained psychologists are qualified to read children's drawings.

1.6 Research Topic/Issue

The research issue is "Can we use information in children's drawings to inform teachers' practices?" mainly directing at lesson planning and teaching in the Singapore context. Kilbane & Milman (2005) suggest that lesson plans are artifacts, a special type of evidence providing factual information upon which judgment of teacher quality, communication skills, knowledge of content and instructional skill can be made. They provide information about how much or how little the teacher knows about the topic/theme; a teacher's value and interests; and allows us to be able to formulate hypotheses about a teacher's knowledge of instruction and learner needs by examining the match of the content, target audience (students), and instructional method. A lesson plan's objectives are indicative of the outcome expected of the learners' and teachers' assumption of children's sufficient or insufficient knowledge of the subject/theme/topic. Therefore, this study aims to enhance Singapore teachers' lesson planning and teaching by incorporating children's prior and spontaneous knowledge gained from reading the drawings. The sub-questions raised in this study are:

1. Do teachers plan lessons in consultation with children's prior knowledge? (see Chapters 5 and 6)

2. Do teachers teach to extend learning or reinforce what children already know? (see Chapters 5 and 6)

3. Is there a match/mismatch between what teachers think children know or do not know? (see Chapters 5 and 6)

4. Are teachers pitching the lesson at too high or too low a level to the advantage or disadvantage of children's prior knowledge? (see Chapters 5 and 6)

5. What are teachers' view about the role of prior knowledge in teaching and learning? (see Chapter 4)
6. How do teachers find out about children's prior knowledge? (see Chapter 4)

The investigation chose to use children's drawings to investigate these questions because drawings are windows into a child's mind a notion supported by many theorists (Gardner, 1980; Efland, 2002).

1.7 Research Aim

Young children's drawings are familiar in classrooms around the world. Teachers use them for all sorts of reasons. But, do they use them as a source of information about the children's prior knowledge and experience, current experiences and new understandings? I would suggest that there is information in-built in children's drawings. What is needed is to identify the nature of "information" encapsulated and explore how teachers could elicit that information. The research hypothesis is: "Can information in children's drawings be used to inform teachers' practices?"

"Information" here is being used in a very broad way. It refers to more than just factual information. Krathwohl et al, (2001) defined factual knowledge as knowledge of discrete, isolated content elements – "bits of information" of "terminology and knowledge of specific details and elements" (pp. 27 & 45). "Information" in this study includes knowledge and ideas gained from non-formal learning acquired outside of the school (e.g. through parents' teaching or reading to the child, the child's personal experiences and knowledge gained through interacting with the environment, people, picture books and/or through play). Sometimes, in this study it is described as a "spontaneous concept" expressed and represented in children's drawings beyond what was taught in a classroom. In addition, information, as used in the study, also hopes to incorporate knowledge of concepts, procedures, metacognitive, and cognitive processes, all of which are thought to contribute to a child's overall intellectual development in thinking and learning. A

tool that could identify these would, therefore, be useful. One possible tool to identify these is the Bloom's Taxonomy of Educational Objectives (TEO) framework or the revised Anderson & Krathwohl (2001) framework. Consequently, the aim of this study is to design a framework to elicit the above-mentioned information from the children's drawings to facilitate teachers to teach for understanding with an equal emphasis on knowledge-content and thinking processes (Newton, 2012).

1.7.1 Developing the Research Aim: The Three Research Components

In this section, the investigator would like to give the reader an overview of the components of the research (the three phases) and how they relate to the overall aim discussed above by describing the contexts and responses of teacher-respondents, and children-participants in components I, II and III.

The Singapore context for teaching and learning is such that even with very young children there seems to be an emphasis on teaching for facts. In Component I the teacher-respondents (pre-service and in-service teachers) participated in a questionnaire survey mostly in classroom settings at the point of data collation. The purpose was to provide a baseline context for the main study (Component II and III) in order to elicit what are teachers' preferred strategies to find out about children's knowledge prior to teacher's teaching and whether they considered "children's drawings" as one of the strategies? In Component I, the teachers responded very positively to the survey. Some of the teachers took the chance to complain about the demand of the curriculum found in the Singapore system that left them with no time to look into the children's prior knowledge as a lesson starting point. They commented that:

> *"It's not the teacher's choice to decide but to rush to complete it."*

> *"If this topic is in the curriculum I feel obliged to teach it. I have to follow the directions and theme as provided from the management level."*

"Is compulsory to follow religiously."

"In the school system, the curriculum has pre-determined standard themes;"

However, most of the teachers took the questionnaire quite seriously, they were observed spending about 20 to 30 minutes of quiet time thinking, reflecting and writing down their thoughts and feelings carefully before handing them over to the investigator. This is discussed fully in Chapters 3 and 4.

In Component II, the purpose was to collate raw data of 5 - 6 years old children's drawings from two preschools. There were 14 children who produced drawings of "wild animals" from a childcare centre that provides education and childcare services from 7 a.m. to 7p.m. catering to the needs of working mothers. While another 11 children produced drawings of the "water cycle" from a church-based kindergarten that provides two separate sessions of 3-hourly education services only (see Chapters 3, 5 & 6). The drawings and observations were carried out in natural settings where children sat in groups of four to seven in their respective preschools. The themes chosen for the drawings were part of the preschool's ongoing curriculum at the point of research visits. The investigator made three visits per preschool as scheduled by the preschool's principal/supervisor. The rationale of a 3-day visit was to observe and video record lessons development and children's responses to the drawing tasks. The duration of each visit was about 2 hours 15 minutes (40 minutes for each pre- and post-lesson drawings and 45 minutes of teacher's teaching). The pre- and post-lesson drawing tasks' instructions were set in accordance to the teachers' lesson's objectives, which were agreed and verified with the respective class teachers in private before the investigator met with the children (see Teachers' lesson plans in Appendices E & F). The teacher's lesson objective for the wild animals was: "*Children will be able to name and spell a list of wild animals*" (see Appendix E). When probed further by the investigator the teacher contemplated for a while and verbally told the investigator that she would like to see whether the children could name and spell the list of "*lion; tiger; elephant; fox; wolf; rhinoceros; monkey; zebra; deer; giraffe; and cheetah.*" Consequently, having verified the class teacher's teaching intention, for pre-and post-lesson drawings the

same instruction was given. The children were asked to: "*Draw what you know about wild animals; name and spell them*" and was given by the investigator to the 14 children. For the "Water cycle" drawing tasks, the teacher's lesson objective was: "*Children will be able to identify the various stages of the water cycle – evaporation, condensation, precipitation (rain), collection"* (see Appendix F). So, once again, the teacher's teaching intention was established, the investigator gave the same instruction for pre-and post-lesson drawings to *"draw what you know about the water cycle"* to the 11 children. In the following sections, to give the readers an idea of the contexts of the study and "who said what" (teachers' and children's responses) at the two preschools are accounted for; beginning with the "wild animals" then the "water cycle" drawing tasks.

Pre-lesson drawing on the wild animals: the children were excited to find different coloured markers of 2 to 5 mm thickness and 120 gsm white papers on their tables. They eagerly unplugged the markers' caps and got on with their drawings, taking feedback from emerging lines and symbols to create pictures/stories of wild animals effortlessly. Sometimes, they were heard talking aloud to themselves or to their peers, for example, a girl attaching rectangular and parallel lines to create the legs and structure of a bench with an orange marker was identifying to the investigator "tis'a bench." There were also occasions where a couple of children asked "how to spell… (a particular animal's name) erh?" However, both the investigator and the teacher would encourage them to try spelling it and the children tried to spell them phonetically (e.g. "cup" for "cub"). After about 40 to 45 minutes of picture-making when each child was done he/she would readily hand them over to the investigator. The investigator interviewed and annotated the child's descriptions on their drawings (see Children's drawings Appendices E1 – E28) sometimes resulting in a long queue of eager and impatient children trying to cut into each others' conversations with the investigator to have their drawings annotated. Once all the 14 children's stories were well-annotated the investigator kept the drawings away safely, and the class teacher took over the class.

The teacher then conducted a 40 to 45 minutes of lesson on the wild animals and observed by the investigator (see Chapters 3 & 5).

Post-lesson drawing on the wild animals. The children were very enthusiastic to produce another drawing of wild animals. The details in the post-

lesson drawings bore evidence of a total lack of fatigue (See Appendix E1 – E28). In fact, they looked confident and began the second drawing with a greater sense of purpose. Perhaps, they were glad to be given another chance to demonstrate what they know about wild animals having received some input from the teachers and/or to express their personal views and opinions about what wild animals meant to them at a personal level. Thus, the drawings showed the children were still very much occupied with their schematic interests and reflected little changes in conceptual knowledge except over limited factual knowledge gained from the teacher's lesson. This is discussed fully in Chapters 3, 5 and 7.

The following is a descriptive account of the "Water cycle" drawings by 11 children from a church-based kindergarten.

Pre-lesson drawing on the "Water cycle." The investigator, having verified the teacher's teaching intention and lesson plan, came to an agreement with the bespectacled class teacher in green top that the same instruction for the drawing tasks for pre-and post-lesson drawings was "*draw what you know about the water cycle.*" For the afternoon session, about 1.30 p.m. the 11 children arrived and seated on the floor in front of the whiteboard, the investigator introduced herself and explained the purpose of her visits. Once the children were clear about the instruction and drawing tasks they returned to their tables seated in groups of four. Initially, some children were rather hesitant and contemplative wearing "what shall I draw?" looks on their faces. When they looked around at their peers who already had started drawing with a blue marker, instinctively the hesitant ones took a blue marker made the first mark and then developed with each visual feedback. Before long they got on with their drawing taken over by their individual interpretations of what the water cycle meant to them personally and not too concern about whether it was "right" or "wrong." Although, in the midst of their drawings some friends commented e.g. "teacher he draw bathroom!" or "teacher I don' know …" after some reassurances from the investigator to simply draw what he/she knows about the water cycle, the child feeling assured started to get on with his/her interpretations of the water cycle. After about 10 to 15 minutes into drawing some children were heard and seen talking, laughing, gesturing and explaining (e.g. "boy is drowning and calling for 'help!'") to themselves and to their friends as their visual story of the water cycle emerged on paper. While the rest continued to draw quietly, thinking

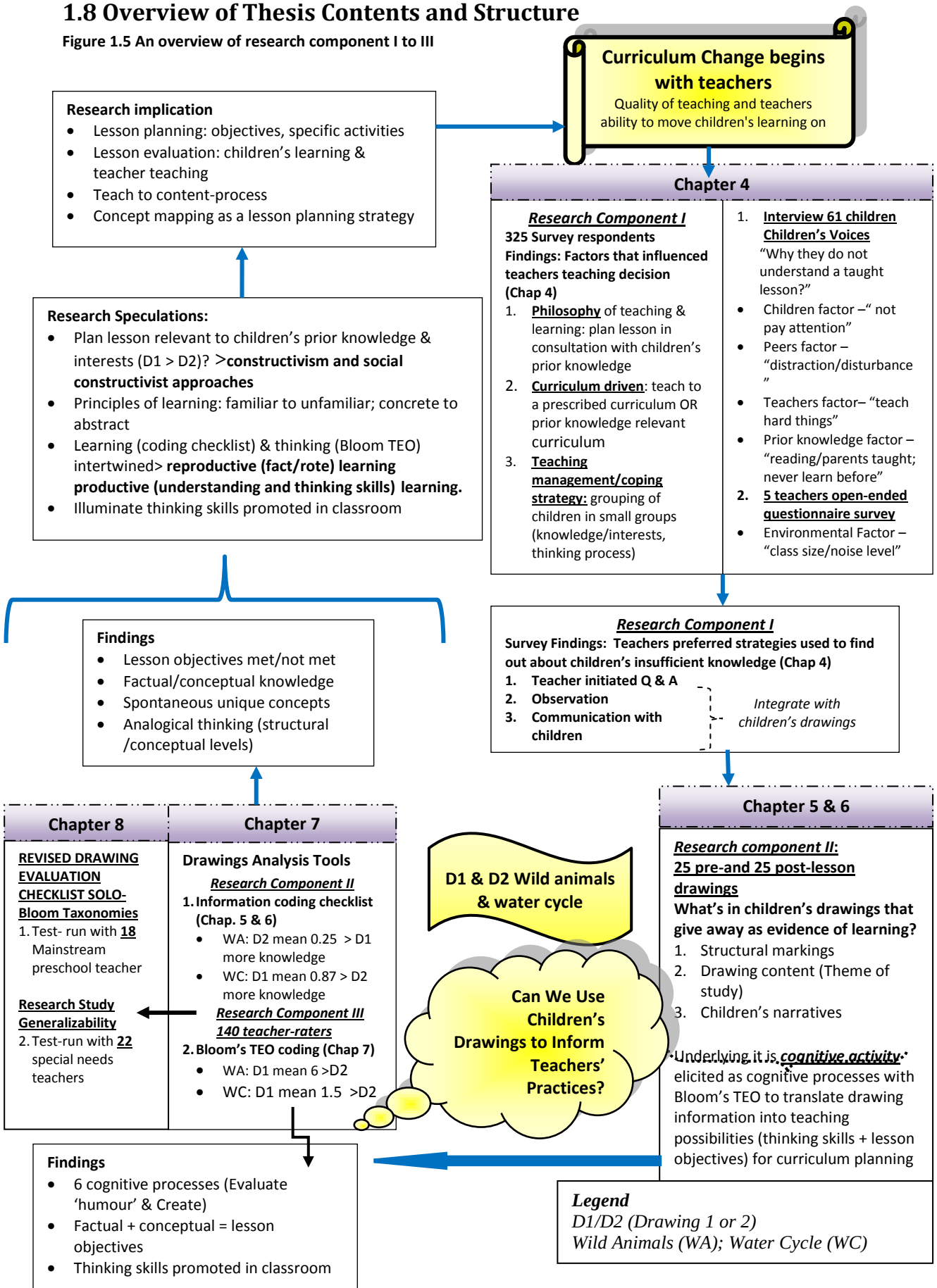
and switching between coloured markers. The teacher then taught the planned lesson and again observed by the investigator for the next 30 to 40 minutes.

Post-lesson drawing on the "Water cycle." After the lesson, the children returned to their second drawing happily and spent more time constructing their drawings than completing the worksheet! Obviously, there was no sign of any fatigue. Perhaps, drawing was a welcome change to their daily worksheets routine? Or drawing gave the children an opportunity to start from scratch by exploring the idea of the water cycle from their perspectives in contrast to a worksheet? The class teacher reported 90% children completed the worksheet correctly. On the contrary, findings of the post-lesson drawings presented a different story. They showed children's naïve understanding of "precipitation and collection" but little understanding of "condensation and evaporation." The children appeared able to differentiate between the degree of free expression expected of a worksheet and making a drawing. They regurgitated text-book answers for the worksheet while still holding on to their personal experience and perceptions of where water comes from in drawing. (Future research could investigate children's perceived notion of worksheets versus drawings). This is fully discussed in Chapters 3, 6 and 7.

In research Component III, the focus was on the development of a tool to help teachers to "read" drawings. By this I am using the verb to read to indicate an interpretative state – looking for hidden information, meaning, thinking, understandings that were implicit in the drawings. The aim was to look at children's drawings carefully, informed by a framework, so as to understand by allowing the meaning of the visual or graphic text speaks to the reader with an aim to gain some knowledge about the child's content-knowledge and thinking processes out of the reading. It is more than just to "interpret" by providing or explaining the meaning of the drawings from an interpreter's perspective. To "read" implies a two-way understanding between the reader and the visual/graphic text and it results in knowledge gained. The tool was built around Bloom's Taxonomy of educational objectives (1956) and Anderson & Krathwohl (2001) further refinement added Biggs's and Collis's (1982), Structure of Observed Learning Outcome (SOLO) perspective. It was trialed in a range of contexts. These are discussed fully in Chapters 3 and 7.

1.8 Overview of Thesis Contents and Structure

Figure 1.5 An overview of research component I to III



Chapters 1 to 3 discuss research motivation, theoretical perspectives, overview of research methodologies for research components I to III, and observations of research principles, ethics, reliability, and validity issues. Chapter 4 discusses research component I on teachers' values and beliefs of prior knowledge to teaching and learning impacting teaching decisions. It also discusses teachers' views of children's drawings as an alternate informal assessment strategy. Chapter 5 discusses research component II findings from 14 pre-and 14 post-lesson drawings on wild animals "read" with a coding checklist matched with teacher's lesson objectives. Chapter 6 examines 11 pre-and 11 post-lesson drawings on the water cycle also matched with a coding checklist to teacher's taught objectives. Chapters 5 and 6 examine whether there is a match or mismatch between teacher's assumptions of what children already know and whether the type of information encapsulated in the drawings can guide the search for appropriate curriculum content to challenge children's thinking and extend their learning. Chapter 7 examines research component III findings from 140 teacher-respondents' evaluations of wild animals and the water cycle drawings with the Bloom's TEO drawing evaluation checklist. Chapter 8 gives an overview of the discussions spanning chapters 4 to 7. Based on the respondents' feedback the drawing evaluation checklist was later improved/revised by combining the Bloom's TEO with the Structured of Observed Learning Outcome (SOLO) by Collis & Biggs (1982) to improve on the evaluation of "qualitative and quantitative aspects of the learning" demonstrated in the drawings.

The revised checklist was tested with 18 mainstream preschool teachers to evaluate wild animals and the water cycle drawings at random. To test for generalizability (Bassey ,1999) another 22 special needs teachers were taught to use the checklist to evaluate 17 high-functioning special needs children's (5-6 years) pre- and post-lesson drawings on a diverse range of topics under the broad theme "My School" (e.g. "my friends;" "things in the classroom;" "things I like to do with friends;" and Singapore National day and Racial harmony day celebrations coincided at the point of visit). They were of mixed learning disabilities - nine children with Global developmental delay (GDD); five with Autism spectrum disorder (ASD); two with speech delay; and one Asperger. Chapter 9 concludes with research implications and connecting the discussion back to Chapter 1 on teachers'

pedagogical beliefs and children's drawings as an alternate informal assessment strategy to inform teachers in curriculum planning.

Chapter 2 Literature Review

2.1 Introduction

The main focus of the study is to explore the idea that teachers can use information in children's drawings to inform decisions and practices. In this chapter, literature related to this focus is explored in terms of three curriculum agents: the children; the subject matter; and the teacher (see Table 2.1).

Table 2.1 Literature review on three curriculum agents

Curriculum agents	Literature review on:
2.1 The Children	**How do children think and learn?** Principles of learning as processes and conditions of learning are explored in the related theoretical strands: • Piaget & Vygotsky constructivism theories on prior knowledge and conceptual change • Analogical thinking (Goswami, 1998) • Revised Bloom's Taxonomy of educational objectives (TEO, cognitive domain) (Anderson & Krathwohl, 2001) • Structured of Observed Learning Outcome (SOLO; Biggs & Collis, 1982)
2.2 The Subject Matter	**Theories about children's drawings that give away as information of children's learning:** • Marking-structures, • Drawing content or meanings constructed, and • Children's narratives/descriptions of the drawings • Karmiloff-Smith's (1990, 1992) Representational Redescription (RR)
2.3 The Teachers	**Teachers' pedagogical beliefs and practices:** 1. Link between beliefs and pedagogical actions 2. The process of teacher change

The discussion begins with an exploration of how children think and learn, then theories and issues on children's drawings are discussed, and finally, teachers' classroom practices involving pedagogical beliefs and its implication for curricular planning and assessment.

2.2 Children as Curriculum Agents

2.2.1 How do children think and learn?

How children think and learn is related to teachers' instruction and communication in classroom setting. So, what is learning? Goswami (1998) viewed learning as the "modification of behaviour in the light of experience... measured in terms of what has been remembered as a result of learning" (p.60). What is modified and remembered has relationship with prior knowledge due to a process of information matching between new and old input. Whitebread (2012), succinctly described learning is a process of:

> *Establishing patterns, pattern matching and making links between patterns. When some information we have already encountered before is received again, it excites an already established pattern of neurones, and this exact match is perceived as recognition.* (p. 96).

Learning is pattern matching and making links because there is "information we have already encountered before" (Whitebread, 2012) known as "prior knowledge" (Vygotsky, 1962) that needed matching to the new knowledge for that information to be recognised and adapted into existing knowledge structure. Constructivist theorists, like Piaget, Bruner and Vygotsky each offered a varied view of the child as an active learner in knowledge construction either by themselves or with support from others. Piaget proposed a child's actions and operations in a four-stage theory of readiness of mental structures in cognitive development (taking in of information, "assimilation" and adapting it to existing knowledge structure, "accommodation")

for learning to take place. Relevant to the discussion is pre-operational stage (2 - 7 years) where children engaged in symbolic thinking and representations through language and image from egocentric and concrete view-points. Moving on to Bruner (1974) he explored processes of reasoning in creative problem-solving in three categories of representations that learners use to store different kinds of knowledge (in Whitebread, 2012; Cubey & Meade, 2008):

- Enactive representation: action-based representation to store memories of action;
- Iconic representation: in picture or images of things to store experiences and perceptions; and
- Symbolic representation: using language or mathematical symbols to store thoughts, ideas, general rules and principles.

Pertinent to the study is iconic representation category in which children store information in pictures (discussed under "children's drawings"). Next, Vygotsky's (1978) proposed zone of proximal development (ZPD) is facilitated within a socio-cultural context involving a more competent other where thought development is scaffolded by connecting between a learner's prior knowledge (as a gauge of a child's readiness to learn) and new experience to progress to the next level of development. Vygotsky's theory largely underpinned the rationale for reading children's drawings for information of prior and spontaneous knowledge for curricular planning. A child's readiness to learn is connected to non-formal and formal teachings happening at home and school. According to Bruner, a child stores knowledge in visual representation by memorizing, perceiving and attending to details to keep a record of the context and sequence of their experiences (e.g. a visit to a fire station). It is a process of spontaneous memorization of committing information to memory, interacting with emerging lines and marking-structures to encode something that makes sense to the child (Matthews, 1999; Wood 1998). The information recorded according to Athey (1990, 2007) is a form of thought comparable to Piaget's idea of cognitive structures known as "schemas" consisting pieces of ideas and concepts indicating common themes or "threads of thinking" (Nutbrown, 1999). Athey (2007) proposed two types of schematic information:

action schemas are repeated patterns of action (e.g. vigorous push pull actions  to track falling rain) and figurative schema of static symbols (e.g. a house, or chair  the way children perceived the environment). Matthews (1999) also identified similar modes of representations known as action or dynamic representation and configurative or shape representation. These schemas are stored in a child's sub-conscious mind as implicit memories made explicit in visual representations (Cubey & Meade, 2008; Athey, 1999). Karmiloff-Smith's (1990, 1992) *Representational Redescription (RR*) (cited in Jolley, 2009) explained how the implicit is made explicit through drawings (discuss under "subject matter" on children's drawings). The implicit memories made explicit are related to a child's prior knowledge, which is instrumental in meaningful conceptual change in a child's quest for knowledge.

2.2.2 Children's prior knowledge and conceptual change in learning and thinking.

Serdyukov & Ryan, (2008) suggested that "knowledge is associative" (p.186) therefore, for true learning to take place resulting in conceptual change, it must evolve from a learner's prior knowledge (Black, McCormick, James, & Pedder, 2006). The prerequisite of meaningful or true learning is the connection of one idea to another (Serdyukov & Ryan, 2008). What is prior knowledge? Serdyukov & Ryan, (2008) suggested it is "the understanding that students bring to a classroom" prior to teacher's teaching (p. 237). Its role is to help learners to "make out familiar patterns of thought within the new knowledge in order to interpret new or enhanced meanings" (p.237). Within constructivist framework, prior knowledge is a significant factor in learning because learners cannot interpret new meanings in a vacuum. How does a learner construct understanding? Resnick (1983), a curriculum specialist, proposed that learning is a process where understanding is constructed out of naive theories in the absence of complete information. Secondly, to learn is to know relationships between old and new knowledge in order to interpret the familiar in the unfamiliar ones (e.g. drawings of the water cycle shows children connecting abstract concepts of phases of change in the water cycle as water movements via water pipes [naïve theory]). Indeed, "all learning depends on prior knowledge" (Resnick, 1983, in George, 2004, p.113). This notion is reinforced by Serdyukov & Ryan's, (2008) model of "iteration of learning" (p. 90) about how conceptual change

takes place when new knowledge is merged with pre-existing knowledge at a higher level. Thus, the "iteration as a process presupposed a gradually expanding set of information added to each preceding cycle to increase the initial knowledge and increase learning within each cycle" impacting knowledge retention and skill development (p.90). The increased learning is equivalent to Vygotsky's proposed zone of proximal development, leading to an "individual's continuing, general development" (Dewey, 1938, p.36). In education, *development* should be the primary focus (Hamilton, 1980; George, 2004) but regrettably, in most preschool classrooms, Singapore teachers and children are busy and happy "doing tasks" (e.g. baking and doing craft works) little true learning involving conceptual change (Black et.al 2006, p.123) that grows out of experiences children already have (Dewey, 1938; George, 2004). There were many studies by Carver & Klahr, 2001; Chaffin & Imreh, 2002; Keil, 1999; Lesgold & Nahemow, 2001 (in Santrock 2004, p. 266) that matching teaching to what the learner already knows enhances the ability to remember new information. What happens when teaching is not built upon prior knowledge? According to Song, Hannafin & Hill, (2007):

> *Student is unable to create a relevant connection between to-be-learned information (i.e. the new learning phenomenon) and existing knowledge might avoid engaging in activities, thus minimizing the prospect of conceptual change*. (Song, Hannafin & Hill, 2007, p. 32)

In other words, no learning takes place and gravely the learner may avoid learning it at all! Another function of prior knowledge, Song, et. al. (2007) suggested it serves as a guide to:

> *Students' assessments of to-be-learned knowledge and teaching activities. Alternatively, when to-be-learned concepts are inconsistent with prior knowledge, cognitive dissonance may signal students' need to reconcile personal understandings with new knowledge or examine how teaching activities do (or do not) help to address dissonance* (Song, Hannafin & Hill, 2007, p39).

In other words, prior knowledge helps learners to identify discrepancy or gaps between old and new information that causes conflict in understanding, known as "cognitive dissonance." Cognitive dissonance may serve as a potential spark to motivate learners to make an effort to reconcile the cognitive conflict (but, heavily dependent on a learner's motivation to learn to resolve the conflict). Ausubel's (1968) work on "meaningful learning" and "schema" theorists like Anderson (1977) agreed that "the single most important determinant of learning is what the learner already knows; ascertain that and teach him accordingly" (in George, 2004, p. 63). Ogle (1986) developed a group *K-W-L* instructional structure to access children's prior knowledge. It is a language-based approach where the teacher elicits from the children what they ***Know*** (what I know); then what they ***Want*** to learn; and after intervening instruction declare what they have ***Learned*** (Serdyukov & Ryan, 2008, p.30). However, the criticism was a young child may have great difficulty formulating thoughts into words or simply gave "random guesses and textbook-like answers" to general questions that had no relevant meaning to the child (Hein & Price, 1994, p.17). The K-W-L model served to signify the importance theorists placed on children's prior knowledge to enhance teaching and learning. But it seems that in real classroom practices observed in Singapore, teachers applied the K-W-L model mostly as tune-in activity, a routinized brief session of question-and-answers (Q & A) and then proceeds to teaching their pre-planned lessons with little regard for children's verbalized prior knowledge.

A teacher's understanding of the role of prior knowledge in a child's learning has implications not only on curricular decision and planning but also achieving, educational goals. Anderson & Krathwohl et. al. (2001) suggested two key educational goals – (1) to promote *retention* of the taught material and (2) to promote *transfer* to use the taught material to solve new problems, answer new questions and to make sense of new subject matter (Mayer and Wittrock, 1996 in Anderson & Krathwohl, 2001, p. 63). Therefore, it is critical to "examine the curriculum from the point of view of the learner" for retention and transference of knowledge to develop children's next zone of proximal development (Hynes, 2010, p.137). Children are active learners who activate prior knowledge by connecting one idea to another through analogical reasoning. This claim is supported by Strike's and

Posner's (1992) revised model of *conceptual ecology* of "anomalies, analogies, and metaphors, exemplars and images, past experiences... " that learners generate to scaffold their learning (cited in Song, Hannafin & Hill, 2007, p. 30). The next section discusses the significance of analogies in learning and thinking.

2.2.3 Analogical reasoning in children's learning and thinking.

How do children learn? Goswami (1998) proposed that children learn by imitation and analogy through a process of recognition monitoring based on what is remembered as a result of learning. Whitebread (2012) suggested the "human brain is good at recognising information it has already attended to and received on a previous occasion" (p.95) simply put, "prior knowledge" is significant to establishing meaning and understanding. According to Craik and Lockhart (1972) when "new information is deeply connected with existing knowledge" having meaning and making sense to the learner, the more likely it will be remembered and recognised (cited in Whitebread, 2012, p. 109). In a nut shell, learning and memory together with problem solving and reasoning are a sequence of mental processes to attain a goal (Anderson, 1980). So, how do children think? Extending on the argument for prior knowledge, children think and learn by analogy. In analogical reasoning, the child actively seeks out familiar pattern of information acquired previously to identify and relate with new information to make sense of a new experience or information related to a separate context (Goswami, 1998). Winston (1980) explained plainly that in learning analogy:

> *We face a situation, we recall a similar situation, we match them up, we reason, and we learn.*
> (p. 1 cited in Goswami 1998, p.64)

To reason about relations requires a child to draw on their prior knowledge (e.g. a human being has a heart), and then transferring that knowledge and decide whether a dog has a heart recognising both organisms share similar "characteristic features" (they move, eat, sleep and purge) (Goswami, 1998 p.104). This is similar to a

Piagetian example "bicycle is to handlebars as ship is to rudder" (the similar relation here being "steering mechanism"). Whitebread (2012) considered this ability as "transfer of learning" or "generalisation" significant to human adaptability and capability in problem solving (p.121). Goswami (1998) also suggested analogical reasoning is a critical cognitive tool for children's knowledge acquisition and representation, and conceptual development. Such ability is present in young children even as young as three to four years old contrary to Piaget's conclusion (Goswami, 1992). At a young age, children were able to demonstrate fundamental categorisation ability by grouping things of the same together (recall Chapter 1 "long-ness" classification).

According to Goswami (1998) it is vital to understanding conceptual relations by perceiving perceptual and functional similarity guided by learning the names of things and classes of objects. Goswami, also found children tend to categorise by *thematic relations* (e.g. dog and bone) and not *categorically* (e.g. dog and cat). Thematic relations based on association are critical to analogical reasoning in seeing similarity in the dissimilar. This later facilitates shift in conceptual development in which children learn from "concrete to abstract," "perceptual to conceptual" and "holistic to analytic" (Keil, 1987 in Goswami, 1998, p.104), known as the principles and conditions of learning that teachers have to first understand in order to teach for understanding (Newton, 2012). If analogies involve the recognition of relational similarity then how could a teacher detect the operation of analogical reasoning in young children? Generally, it would be too complex for young children to describe verbally the relational similarity, in contrast to visually representing it by marking-structures, (e.g. a giraffe drawn with four long legs and a long neck with two horns) the child shows knowledge of a true category of zoo/wild animals; and spatial arrangement of proximity (e.g. drawn next to a tree it shows relational understanding that giraffe is herbivorous). Goswami (1998) identified as "analogical conception" of meaning and content (concepts and schemas) knowledge or "meaning-based knowledge representations" (p.53). However, due to the visual nature in drawing, in addition to analogical conception, there is another aspect, "analogical structure" or "analogical perception" (Arheim, 1969). Analogical structure refers to marking structures where a child observed some similarity between graphic forms. For example, a child obviously working on a schema of

things triangular in shape (see Figure 2.1) - a sandwich, a tent, frizzy drink, a body attached to an inverted triangular face showing analogical perceptions and "visual thinking" (Arheim, 2004) of a three-pointed structures of "triangular-ness". Arnheim (1969) concluded "analogical perception is basic to intelligent behaviour... (that) make productive thinking possible" (in Hope, 2008, p.48 ( ) added). Arnheim's (1969) notion of "intelligent behavior" refers to higher order reasoning, between the relations between objects as characteristic of a "final stage of logical development" (Goswami, 1998, p.xxi). Hope (2008) also observed analogical quality in young children's "drawings [that] express relationships" ([ ] added p.4). She observed children used lines to mean many things and to resolve "a whole range of visual and intellectual puzzles and representations" (p.65). Hope saw drawing as "thought development" activity where children perceived meanings and decisions about how a drawing communicates information to others:

Figure 2.1 Schema: Inverted triangular face, body, tent, frappe and sandwich

> *Drawing is not just a product or container for thought, it is also a process, a journey of thought development. It is the analogical and metaphorical nature of drawing that enables this process thinking to happen*
> (Hope, 2008, p.67).

Hope (2008) identified that in picture-making it involves "thought, ideas, imagination, memory and perception, in which drawing acts as both an open door and as a gate keeper" (p.67). Drawing as an open door because it is a journey of thought development. Thinking by planning and generating "metaphor, analogy, semiotics and symbolism" (p. 6); as gatekeeper to explore a range of new possibilities in every direction. Goodnow (1978) also observed *visible thinking: cognitive aspects of change in drawings* in her study of children representing actions (e.g. running and walking) by noting their sequences of change in the construction of some general feature of actions. She concluded there was evidential "accessible,

visible expression of thought" (p. 641) in children's drawings. Lakoff and Johnson (1980), and Goswami (1998) agreed that all human knowledge is created through application of metaphor from the already known to the new encounter. Children have the ability to use "drawing as an analogical bridge between the real world of observation, the inner world of the imagination" (Hope, 2008, p.46). To sum up, drawing is a cognitive activity that induced analogical reasoning at two levels: (1) meaning-based (analogical conception) and (2) marking-structures (analogical perception) essential to thought development and learning. Hope (2008) argued that drawing is "powerful and accessible yet frequently under-utilised as a means to support thinking in conjunction with other ways of recording and developing ideas" (p.14). Perhaps, drawings are under-utilised as a means to support thinking because no one has really found a way to evaluate thinking-in-drawing?

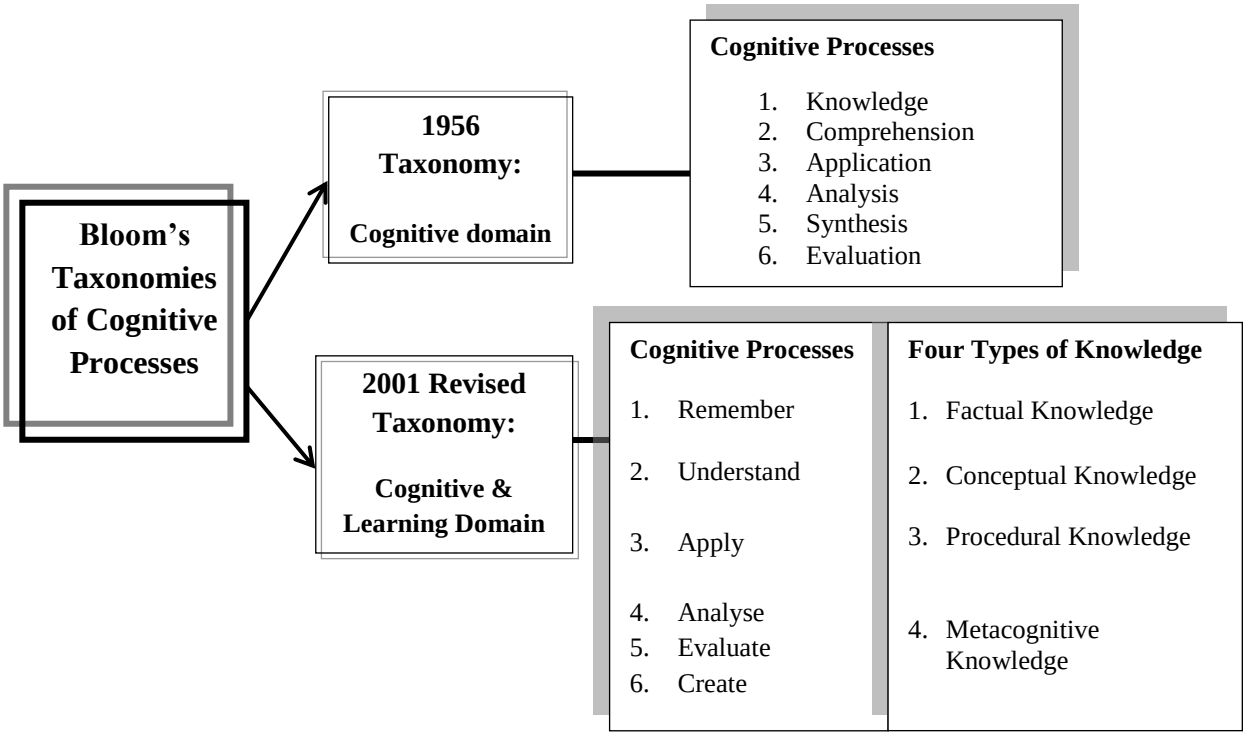
2.2.4 Taxonomies for Learning and Teaching.

2.2.4A Bloom's revised taxonomy of educational objectives (TEO).

Firstly, the discussion begins with a brief introduction of the 1956 original and 2001 revised taxonomies. The original Taxonomy's main purpose was to "facilitate communication – exchange of ideas and materials among test workers" (Bloom et. al. 1956, p. 10). The 2001, revised TEO was to "permit educators to examine objectives from the student's point of view" focusing on learning, teaching and assessing (Anderson & Krathwohl, 2001, p. 34). Airasian & Miranda, (2002) pointed out, the main difference between the two taxonomies was the original focused only on *cognition* dimension, while the revised reflects a dual perspectives of *learning* and *cognition* (See Figure 2.2) and with a "stronger connection of assessment to both objectives and instruction" (p.249). The behavioural descriptive classifications in both taxonomies are organised in a cumulative hierarchical of thought from simple to complex (See Figure 2.2). The revised TEO replaced *Knowledge* with *Remember* because it concerns the learning of factual knowledge. "Synthesis*"* is revised to "Create" and ranked the sixth highest order because accordingly, the logical cumulative effect requires one to be able to *judge* and *critique* (Evaluate) based on criteria or standards before he/she could be creative.

The study adopts the revised TEO framework to evaluate children's drawings because of its dual perspectives.

Figure 2.2 The Bloom's Taxonomies of Educational Objectives (TEO)



What do people really use the taxonomy for?

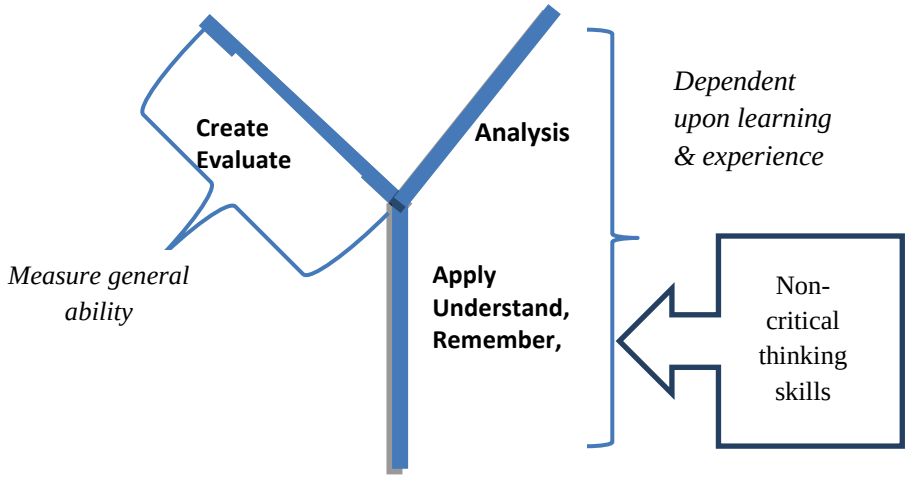
> *In general, the taxonomy has been used for developing comprehensive listings of objectives for particular subjects or entire curricula; describing courses, curricula, instructional materials, oral questioning in classrooms, and test materials with respect to objectives; planning courses and instruction; upgrading instruction; developing test materials and building test-item banks; and conducting research on the structure of learning outcomes.*
> (Furst, 1981, p.449)

Apart from the above-mentioned, unprecedentedly this study uses it as an evaluation checklist to read children's drawings for thought and content-knowledge. Bloom's TEO can suggest the "integral relationship between knowledge and cognitive processes" inherent in drawings (Anderson & Krathwohl, 2001 p. 35). The study of cognition is concerned with processes such as learning, memory, perception,

attention, reasoning, and problem solving (Goswami, 1998). These mental processes are described in observable behavioral terms in Bloom's six cognitive processes; educators can use to identify learning processes and changes in students. Moreover, it is useful for "developing curricula, instructional techniques, and testing techniques" (Bloom, et. al., 1956, p.21). Bloom (1956) suggested the taxonomy could provide a "very suggestive source of ideas and materials" of educational possibilities (p.21) this could be applied to children's drawings too; when appropriately tapped into for information (see Chapters 5, 6 and 7). Howe (1999), when children "re-express an idea in a variety of media they are obliged to make extensive connections to re-organise their semantic networks and so on" resulting in conceptual change (cited in Whitebread, 2012, p.109). Re-organized semantic networks are content-knowledge indicated as narratives and marking structures of forms and symbols suggestive of information stored in drawings. Thus, the revised TEO could be the framework useful for uncovering knowledge of learning and thinking in children's drawings for ideas and materials to teach by connecting with children's prior knowledge for conceptual development. More importantly, the Bloom's TEO conceptualizes thinking processes into observable descriptive terms enabling teachers to match information evidenced in drawings to the respective cognitive processes (see Chapter 7 and Appendix B, a teacher's evaluation of a child's drawing with the Bloom's TEO checklist with 140 teacher-respondents).

At this point, let's look at Madaus, Woods, and Nuttall's (1973) notion of the Y-shaped structure of the taxonomy. This structure implied that only "categories Knowledge (Remember), Comprehension (Understand), Application, and Analysis measure achievement dependent upon learning and experience, whereas Synthesis (Create) and Evaluation measure general ability" cited in Seddon, 1978, p.311; see Figure 2.3)

Figure 2.3 Y-shaped structure of the Taxonomy



This structure suggests the cumulative hierarchical effect between the stem of Y to Analysis, then branches out to measure general ability outside of the learner's learning and experience gained from teacher's teaching. This interpretation is further differentiated into lower- and higher-order thinking skills by Bissell and Lemons (2006). The lower order are "non-critical-thinking" skills considered as hierarchical, and higher order are "critical-thinking" skills which are not necessarily hierarchical. This meaningful construal of the Bloom's TEO supported the study's choice of framework chosen to measure content and process skills induced by drawing because drawing is a highly creative thinking activity.

However, the Bloom's TEO are not without limitations. Sockett's (1971) and Pring's (1971), critique (1) and (2) respectively criticized the Bloom's TEO:

- The dichotomy of "behavioural" objectives and content, the "substantive" element lead to difficulty in means-ends analysis of learning outcome (Sockett, 1971, p. 18). For the reason that it is "not possible to reduce educational objectives to a pre-specified output in terms of certain very specific behaviours" (Pring, 1971, p.83).

- Pring (1971) criticized its artificial distinction between cognitive and the affective domains. He argued that the ability to know and to think and to understand cannot be isolated from mental life of "feelings, valuings and attitudes" because according to him judgment involves feelings embodied as cognitive capacities (p. 86).

- The misguided distinction between knowledge and intellectual abilities because "knowledge entails both comprehension and application" if not, it is impossible for remembering to take place (Pring, 1971, p. 85 & 88). In other words, he argued that knowledge and understanding are connected intellectual abilities not distinctive because understanding operate within a conceptual framework within which the concepts operate.

- Sockett's (1971) criticized the Bloom's TEO lack of "complete and sharp" distinctions amongst criteria/sub-criteria, thus lacking in "internal consistency" contributing to overlapping in the classification (p. 20 & 22).

See Table 2.2 a summary of criticisms and counter-arguments and chapter 8 for more discussion.

Table 2.2 A summary of the Bloom's TEO criticisms and counter-arguments

Criticisms	Counter-arguments
1. Linear hierarchical classification	1. The classification is a continuum of cumulatively in-built into each other spiralling upward (Anderson & Krathwohl, et. al. 2001).
2. Artificial distinction of content and process	2. The evidence cited to support each process criteria/sub-criteria actually fleshed out the content inherent in the subject matter/theme taught.
3. Artificial distinction of the affective from cognitive	3. The affective aspects are illuminated by the "Evaluate" process as criteria of "feelings, valuings, and attitudes" as mental feelings (Pring, 1971, p. 86) for checking and making judgement on inconsistency or inappropriateness of things.
4. Over-lapping of criteria	5. Thinking is complex and abstract. Thinking is a dynamic thought process of conflict and reversibility (Piaget, 1973). Inevitably, criteria over-lapped and appeared in varied forms with discrete emphasis at different levels of thinking.

Nevertheless, its usefulness is proven with over million copies sold and translated into several languages (Furst, 1981). It may not be a perfect framework but it has definitely served a useful purpose of making processes as abstract as thinking observable, describable, identifiable and recognisable for the first time. It has at least given educators a head-start to some ideas and understanding of how to promote and monitor (critical) thinking skills in the classroom and not merely teach for content-knowledge. The framework may be useful in generating insights into how children think and draw.

2.2.4B Biggs's and Collis's (1982) Structure of the Observed Learning Outcome (SOLO) taxonomy.

Biggs and Collis (1982) developed SOLO with the aim of helping teachers to "operationalize" learning tasks into hierarchical increasing levels (see Table 2.3). Secondly, to measure students' responses by describing and evaluating "how much and how well" (p. 3) learning at a particular time for teachers to know at what level an individual child is responding so that teachers could pitch teaching at an appropriate level. In the process SOLO captures information of the learner's "working memory capacity" based on the amount of data captured. It also looks at the "relating operation" whether relationships or interrelations between ideas and/or outside ideas are linked coherently. Next, concerns "consistency and closure," two opposing needs felt by the learner to come to a conclusion or the need for different possible conclusions (Biggs and Collis, 1982, pp. 24 – 25). SOLO places emphasis on prior knowledge needed for higher knowledge acquisition. Thus, it organizes "higher level responses incorporate the knowledge used at lower levels" (Biggs & Collis, 1982, p.175) because prior knowledge has effects on a learner's intention to learn, curriculum analysis, instructional process (teacher's task and content), the outcome of learning and the student's own learning processes (meaningful or not).

Thus, perhaps SOLO complements the Bloom's TEO as a sensitive tool of instruction to understand the "*amount* of information" in addition to cognitive processes (p.186). In a way SOLO also measures the quality of thought processes described as "relating operation" and "consistency and closure." According to Biggs (1979) SOLO's five levels corresponds to Piaget's stages of development but SOLO

has a wider generality because it can be applied across all subject matters just like the Bloom's TEO. However, SOLO's proposed transitional responses, transitional between for example, uni-and multi-structural levels that "contain two contradictory items with a consequent weak or confused conclusion" are conceptually and practically too complicated to determine and apply in assessment (Biggs, 1979, p.385).

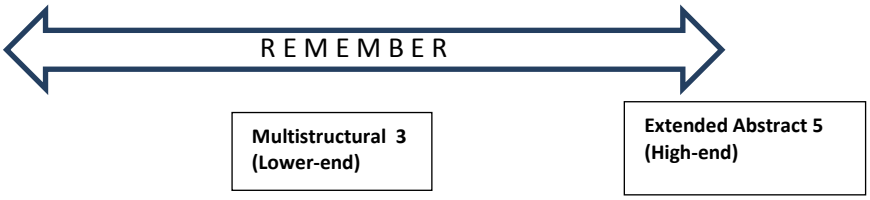
Table 2.3 Structure of the Observed Learning Outcome (SOLO) Taxonomy

1	*2*	*3*	*4*	*5*
Prestructural	**Unistructural**	**Multistructural**	**Relational**	**Extended Abstract**
Disconnected & irrelevant data or no evidence of relevant knowledge is presented.	Only one relevant datum is presented X **1 Element**	Several relevant independent datum are presented not integrated into an overall structure X X X **3 Separate Elements**	Ties up relevant data into an overall conceptual structure X~X~ X~X **4 Relational Elements**	Takes up all the relevant data and their interrelations and introduced information from outside the data & could reason deductively. X~X~X~X~ X OUTSIDE IDEAS **5 Interrelated Elements**

2.2.4C A sample application of the integrated SOLO and the Bloom's TEO - "Remember" process.

When SOLO and the Bloom's TEO are integrated using the "Remember" process as a point of illustration (see Figure 2.4).

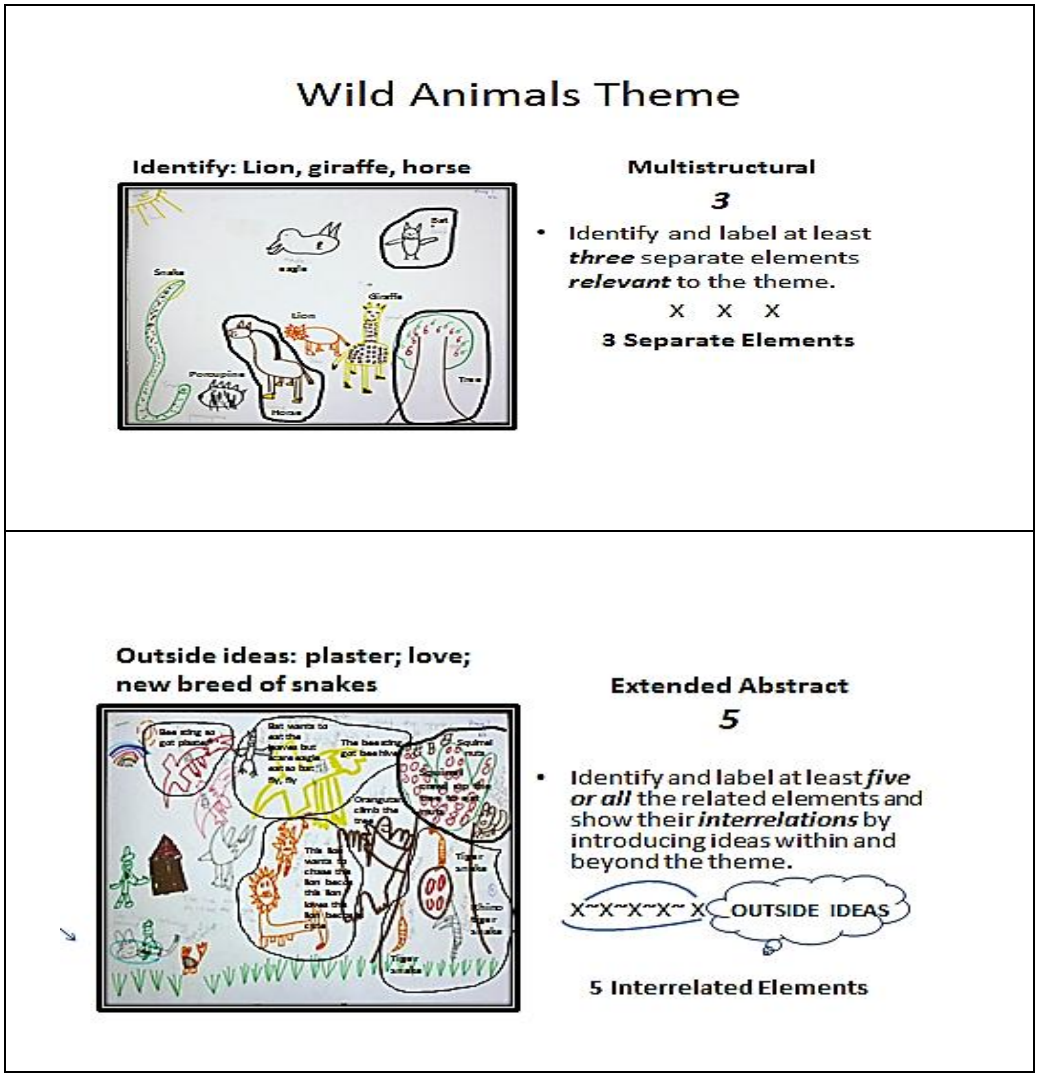
Figure 2.4 Integrated SOLO & Bloom's TEO for "Remember" cognitive process



SOLO provides a new understanding to the Remember process; no longer as a stand-alone criterion (by checking off the presence or absence of it) instead it presented a spectrum ranging from low- to high-end of the remembering process. Perhaps, it may give a more accurate representation of a learner's cognitive performance. For example, a less matured thinker can only remember by recalling several independent bits of information (lower-end). While a more matured (critical) thinker can remember not only by recalling but connects and injects outside ideas to the isolated information and structures it into a coherent whole and draws some decent conclusions out of it to solve a problem.

See Figure 2.5 - The "multistructural" level child could identify and label at least six independent animals (bat, eagle, porcupine, lion, giraffe, and snake) relevant to wild animals theme.

Figure 2.5 A response sample of SOLO multi-structural & extended abstract on "remember" process



While a child at "extended abstract" could identify and label seven wild animals (eagle, hippo, bat, orang-utan, lion, tiger-snake, and rhino-tiger snake). In addition, the child presented understanding of interrelations (by explaining, "*this lion wants to chase this lion becos' this lion loves this lion becos' is cute;" "Bat wants to eat the leave but scare the eagle so bat, fly, fly"*). The child also deductively introduced outside ideas of hybrid animals such as "*tiger-snake"* and *"rhino-tiger-snake."*

2.3 Subject Matter as Curriculum Agent: Meanings Constructed in Children's Drawings as Subject Matter for Lesson Planning

2.3.1 Three Elements of Drawing as Indicators of Learning and Thinking: Marking-structures, narratives, and content-knowledge

Many writers ranging from Luquet (1913) to Jolley (2009) had investigated the different aspects of children's drawings such as the developmental stages of drawings, line-marking structures and the construction of meanings. These perspectives are categorised into three different models (see Table 2.4):

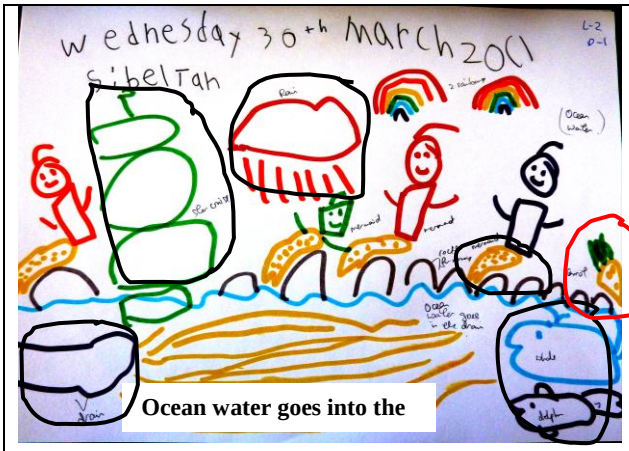
Table 2. 4 Children's drawings and the three theoretical models

Model 1 **Stage Theory** (Children's drawing developmental stages)	**Model 2** **Symbolic Theory** (Line-marking structures/ Perspectives)	**Model 3** **Meaning–Making Theory** (Children's construction of meanings)
Luquet (1927) Piaget & Inhelder (1973) Lowenfeld & Brittain (1987)	Kellogg (1969) Cox (1985) Arheim (1974) Willats (2005)	Freeman (1972) Costall (1997) Golomb (1992) Matthews (1994, 1999, 2003)

Model 1: Linear stage theory consisted of five stages - Stage 1: Scribbling stage (ages 2-3) referred to meaningless random markings. Stage 2: Fortuitous realism (ages 3-4) referred to a child's chance discovery of a similarity between certain feature of the scribbles and objects in reality. For example, a child made two curve line-markings by chance discovered it resembles a "leaf" (originally unplanned),

thereafter, decided to label it a "leaf." Stage 3: Failed realism (age 4 - 5) Luquet classified as synthetic incapacity, the child failed to represent and reflect what was in the objective reality. Stage 4: Intellectual realism (ages 5 - 8) child drew what she/he "knows" about reality and not what they see from a specific viewpoint. Stage 5: Visual realism (age 8 - 12) the child draws in perspective what he/she sees from a certain view point and not influenced by their knowledge of the object in reality (Luquet 1923; Piaget and Inhelder 1973). Figure 2.6 shows examples of intellectual and visual realisms:

Figure 2.6 Examples of intellectual and visual realism



Visual realism: the child drew canonical views of mermaids, star cruise, and rainbows (things/activities on the ocean) seen from frontal & profile viewpoints.

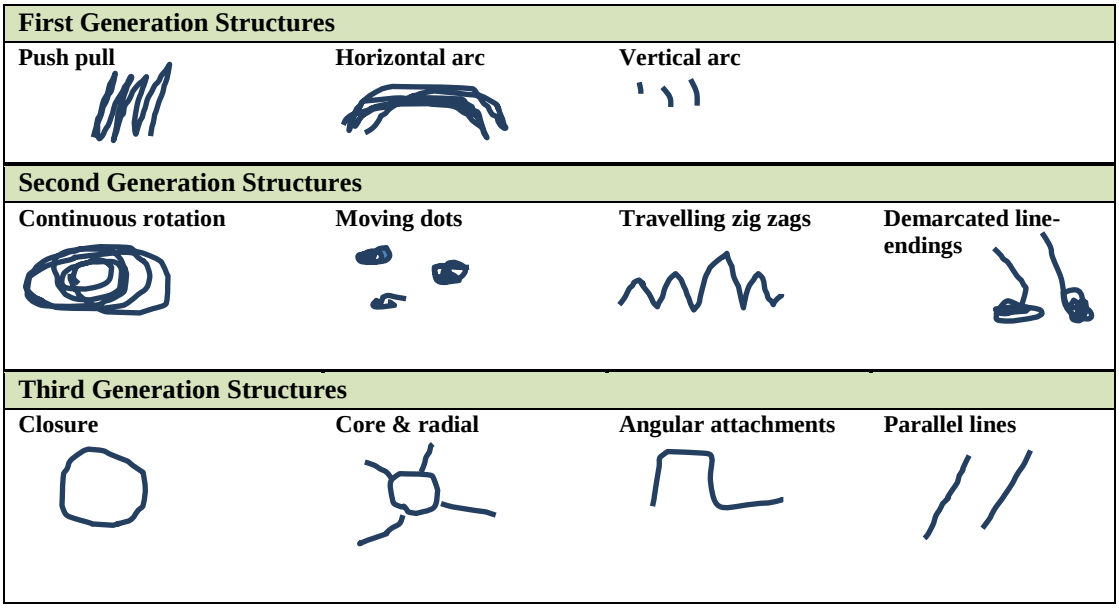
Intellectual realism: the child provided x-ray view of activities *under* the ocean although, hidden from viewpoint e.g. whale, dolphin and drainage pipe.

Athey's notion of repeated **figurative schema**: the child expressed concept and interest in '3-D elongated roundedness' (Willats, 1997) demonstrating knowledge of volumetric entirety (roundedness of whale, dolphin, cruise ship, cloud, and mermaid's tail)

Although stage theory was challenged by many different writers but Luquet's and Piaget's notion of intellectual and visual realisms still hold some truth in it. Young children's drawings showed elements of intellectual and visual realisms. What mattered most was Piaget and Luquet had illuminated the fact that children invested communicative intent of know-how through drawings. Most writers agreed that children's drawings are windows into a child's mind and are pictures of learning (Drummond, 2003). Another revealing aspect of children's knowledge is demonstrated by their selection of markings, lines and symbols out of a repertoire of representational strategies. This was supported in studies by Kellogg (1969), Cox

(1978), Arheim (1974) and Willats (1985), Matthews (1984, 1999). The significance of line-marking structures is indicative of a child's developmental progress and learning in terms of controlled motor movements from early markings ("scribbles") to recognisable symbols crucial to later drawing activity (Matthews, 1983, 1984). Marking-structures offered visual feedback that made the child conscious that marks could be used to represent real objects in the environment. The child learned to monitor movements in time and space in action representations to record an event e.g. a sandstorm with multiple stabbing actions generating dots or vertical arcs and not the visual likeness of objects (Matthews, 1984). The child's selected markings to distinguish components of an object by " 'extracting' or identifying relevant from irrelevant components" shows a purposeful communicative intention of a child (Cox, 2005, p.56). (This aspect of identifying relevant from irrelevant falls under the Bloom's TEO "Analyze" cognitive process [see Chapter 7]). In other words, drawing induces analytical skills. Matthews (1999) categorized marking structures into "three generation structures" (see Figure 2.7).

Figure 2.7 Matthews's three generation structures



These fluid structures generate and evolve into different structures with practice and improved eye-hand coordination (Matthews, 1999). In contrast to Kellogg's (1967) classification of the twenty basic scribbles. Matthews suggested these "information-seeking structures" (1999, p. 155) are part of children's infrastructural enquiry into

the "semiotic possibilities of shapes, marks, actions, sound and colours" (2002, p. 7). The significance of infrastructural enquiry into "what things are, where things are, how they move from place to place, and the child's relationship to them" (Matthews, 2002, p. 7; e.g. where rain comes from and where it goes). (This aspect of children seeking procedural knowledge through drawing is mapped onto the Bloom's TEO "Apply" cognitive process [see Chapter 7]).

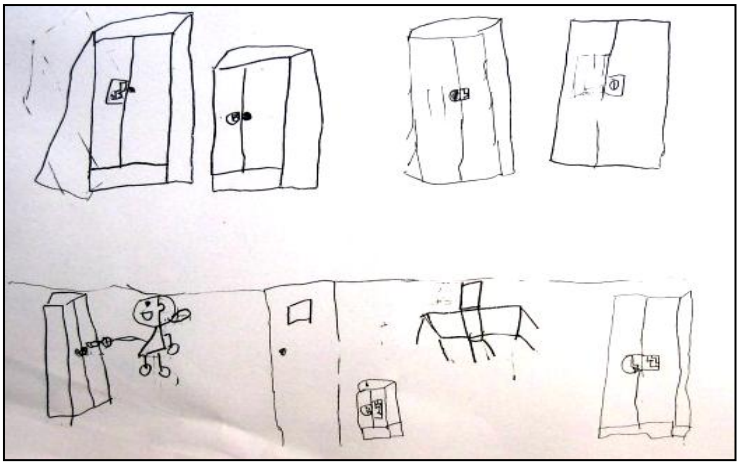
Vygotsky's (1986) suggested a child is learning and thinking in the process of working out the "dual function of symbols and sign" it's referential function of things, people and objects as seen in the environment as well as the represented (cited in Matthews 2002, p.8). Matthews (2002) many years of research into young children's visual representations summed up eloquently that "without children's art there is no thinking at all" (p.8). If this is so; why, children's drawings are under-utilized as a resource of information to learn about a child's view of things? What instrument could help us to look into the "thinking" induced by drawing? Why do children draw? What is the appeal of drawing to young children? Play theorists postulated that children play because they are intrinsically motivated to play and play is pleasurable, it helps young children to expend excess energy. Do children draw because they are intrinsically motivated? Or is drawing a pleasurable activity to them? Hope (2008) suggested that some children were drawn to drawing to "externalise thinking" because the child witnessed "imagination becomes visible and takes form" as emerging action or figurative schemas of lines and symbols. She also suggested that young children had "the need to record visually and graphically" as well as to experience the sensory "power of movement and action" with different drawing media that which could not be considered, manipulated or communicated by words alone (p.5). These researchers' claims of evidences of "thinking" corroborate the significance and value of this study to adopt the Bloom's TEO to capture mental activity produced by drawing.

Sometimes, children also externalize thinking by talking to themselves and/or with interested peers while working out ideas and experiences in the drawing process. Vygotsky suggested that in a socio-cultural context, language played a crucial role in a child's learning. Drawing, a learning activity engaged children at "inter-personal" levels of interaction between child-to-child or -to-adult. Sometimes,

young children were seen enthusiastically sharing moments of humour, "storying," or enacting what was visually represented by gesturing to their friends.

At "intra-personal" level a child engages in self-talk by interacting with the visual feedback of lines and markings emerging on paper (Hope, 2008; Matthews, 1999). Sometimes, evidence of self-talk is left behind as traces of "mistakes" erasures when the child detected anomalies or inconsistencies in their construction of meanings (Whitebread, 2012). (This aspect is paralleled to the Bloom's TEO "Evaluate" process indicative of a child's ability to detect appropriateness or inconsistencies based on a set of criteria [see Chapter 7]). Figure 2.8 captures a five year old girl's self-evaluative process of trying to capture a 3-D cabinet from different viewpoints. This picture also emphasizes the importance of observing the drawing process more than the end-product.

Figure 2.8 A five-year old girl's traces of self-corrections in representing a 3-D cabinet.



The next section discusses how children use prior knowledge to reason analogically, conceptually and perceptually facilitated through language.

2.3.2 Analogical perception of marking structures.

There is evidence of analogical reasoning expressed in children's drawings. See Figure 2.6 the child observed perceptual similarity (structural form) between the slim triangular mermaid's tail and a carrot. The child decided to include it in the ocean scene and offered an alternative explanation for its odd existence in the drawing. Goswami argued that these perceptual differences have "conceptual significance" for children (p. 75). Mandler (1988, 1992) and Goswami (1998) identified as "image schema," analogical representation of the perceptual structure which may be the precursors of concepts because it involved the "active abstraction of key information" into similar perceptual or non-perceptual form that represents meanings and facilitates language acquisition (Goswami, 1998, p.54). Matthews (2002) also observed such "layers of meaning" he described as "metaphoric levels of representation" (p.8).

Children's verbal descriptions or narratives of their drawings are another element that gives away information of the thinking and meaning constructed. Ahn & Filipenko (2007) suggested narratives are children's spontaneous "personal storytelling" (p.280) an "essential form through which children describe their own experiences and communicate their views of the world" (p. 279). In narratives children combined reality and fantasy to reconstruct their knowledge and understanding in diverse modes such as oral, written and visual contexts through play, reading and listening to story, drawing and painting to explain an event, idea or some phenomena (Kellman, 1995; Malchiodi, 1998 in Ahn & Filipenko, 2007, p.280). According to Ahn & Filipenko (2007) children use narratives to make sense of the world and to guide action in drawing. Why do most children draw-and-narrate simultaneously? Perkins (2012) proposed recent neuroscience research confirmed that talking helped the brain to build and expand its connection capability in order to think and learn. Basically, children's narratives are significant to the study of young children's drawings because "their narratives tell us about their ways of seeing and thinking and can offer insight into their meaning-making processes" (Ahn & Filipenko, 2007, p.288). Children's narratives are important to help adults to make sense of children's drawings from children's viewpoints.

Therefore, many researchers like Vygotsky (1986), Thomas and Silk (1990), and Cox (1992) pointed out, to gain understanding of children's purposes in drawing the process precedes the outcome (Whitebread, 2012). Moreover, there are chances children's drawings are hard to interpret unless accompanied by children's verbal descriptions. Thus, most teachers and parents would encourage children to describe their drawings because drawing "stimulates conversation and social support" (Jolley, 2009, p. 40; Matthews, 1999, 2003). Jolley (2009) also proposed researchers to "gently probe the child...to establish the context and motivation behind the drawing" (p. 318) as well as to clarify the culturally determined symbolic meaning unfamiliar to the researcher. To sum up, children's drawings are indeed evidence of learning because children are actively constructing understanding by "organizing, structuring and revising" (Resnick & Klopfer, 1989, pp.14) by responding to the visual feedback (Hein & Price, 1994).

2.3.3 Karmiloff-Smith's (1990, 1992) Representational Redescription (RR).

Young children are naturally endowed with a repertoire of representations (e.g. movements, singing, symbolic play) to make sense of the environment and experiences in normal circumstances. Children also manipulate drawings to make interpretations by generating visual examples to clarify understanding (Bloom, et. at.1956; Anderson & Krathwohl, 2001). In the process, they are making the "fundamentally covert, typically tacit, mental processes" (George, 2004, p.118) explicit through images emerging on paper. Karmiloff-Smith's (1990, 1992) identified this process, "Representational Redescription" (RR). RR describes how a child's implicit knowledge once "procedural, isolated, and inaccessible" is made explicit through drawing (Jolley, 2009, p. 155). This is a process of gradual growth, reorganization and connection (known as "redescription") with the rest of the cognitive system, making clearer sense to the child at three different redescription levels. At level two, the knowledge components (once tacit) become consciously accessible to the child and completing, at level three, an open verbal report or singing a song, producing a sentence or making a drawing that is "meaningful, explicit, and flexible" (Jolley 2009, p.155). Similarly, Meade and Cubey, (2008) discussed a "schema model of the subconscious and conscious" (p.137) referring to

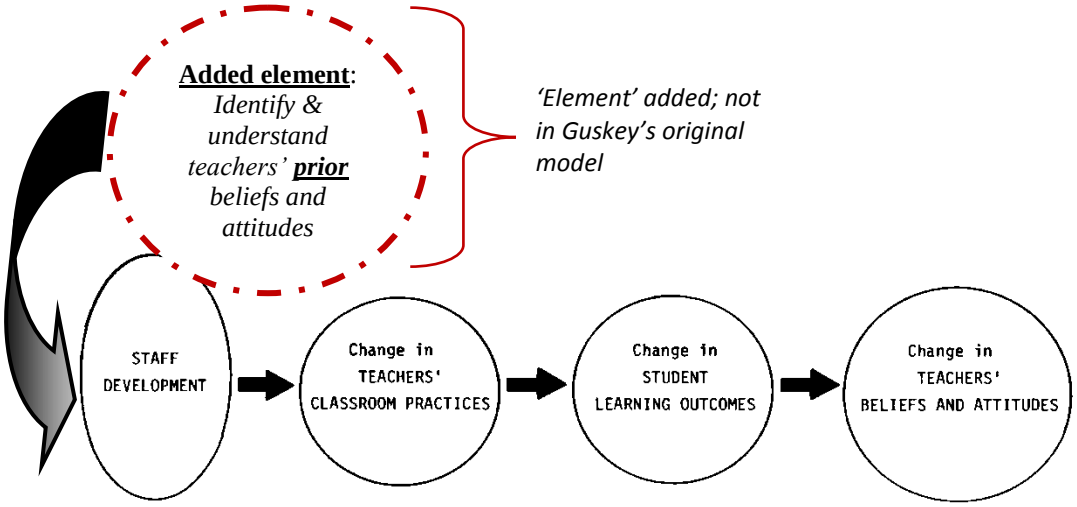
the need for adult's "talk" intervention to make explicit a child's implicit ideas/schemas by identifying and labelling a child's schemes of action or figurative drawing to bring it to the child's consciousness in order to give him/her a sense of their "schematic perspective" (p. 138). Both Karmiloff's and Meade and Cubey's (2008) propositions were only good enough to recognise some form of general cognitive activity between the subconscious (implicit) to the conscious (explicit) but they did not identify by describing the cognitive processes involved in the transitions. Perhaps, the Bloom's TEO six cognitive processes help to fill in the gap. Karmiloff's notion of the implicit level can be matched to Bloom's TEO "remember" process in which the child could only recall or retrieve isolated bits of information identified as schema by Athey (1990, 2007); Nutbrown (1994, 2006); and Meade & Cube (2008). At explicit redescription level two, the child demonstrated consciousness of information is mapped to Bloom's "understand" process of showing conceptual knowledge by interpreting, and classifying by organizing incoming information (Goswami, 1998). At redescription level three, a child showing flexibility of knowledge is matched to Bloom's processes of "analyze, evaluate, and create" where a child could construct, deconstruct and synthesize information at will. In the course of action, children "developing the flexibility of their own representations" extend to creating humour in drawing (Jolley 2009, p.177).

At this point, most probably, the discussion of how children learn and think through drawing has been well elaborated and supported with the relevant literature. The next section covers teachers as curriculum change agents to address how "classroom practices" are implicated through using information in children's drawings to inform lesson planning.

2.4 Teachers as Curriculum Agents

Teachers as curriculum agent hold the key to the type of classroom experiences offered to young children. It is tightly woven to a teacher's pedagogical beliefs and teaching styles, in how children learn and the subject matter is constructed. Pedagogical beliefs referred to a teacher's philosophy or value of education as "a way of thinking, being, or acting" (Oancea, 2012, p.66) based on "the principles [teachers] claim to hold..." (Phillips, 2010, p. 18) that "colour the teachers' thinking about learning and teaching and about organizing the environment" (Meade & Cubey, 2008, p.12). If teachers believe that prior knowledge contributes to children's learning than most probably they would think of ways and means to get at children's prior knowledge even in the way the classroom is organized. According to Smyth (1996) a teacher's values act as part of a filter for new experience and guide its interpretation in selecting and interpreting material to fit a class programme and objectives (p.57). Will teachers select children's drawings as a relatively "new" activity to evaluate drawings for information to guide lesson planning?

Figure 2.9 Guskey (1986) Model of the process of teacher change



Guskey's (1986) linear model of the process of teacher change (see Figure 2.9) is missing out on the prerequisite of understanding teachers' pre-existing beliefs and attitudes before the change process could even begin. Teachers' prior beliefs have implication on whether an innovative pedagogical practice-to-be-introduced will

connect with them or not, which could also help to flesh out other pedagogical misconceptions regarding the new practice. In other words, for example, at the very least teachers must first believe that children possess prior knowledge then teacher's development begins by wanting to learn how to evaluate children's drawings for information leading to change in classroom practices by providing more time and opportunities for children to draw and setting aside time to evaluate the drawings leading to student outcomes (positive or negative) effecting further change in teachers' beliefs and attitudes towards prior knowledge including the idea of drawing as an evaluative tool. The point is, for this study to be relevant to pedagogical practices it has to keep in view teachers' pedagogical beliefs (see Chapter 4). Dunlop (1996) suggested "values has essential link with action. Values provide us [teachers] with reasons for action" ([ ] added p.69). The Scottish Curriculum Council, (1991) suggested "values permeate all educational activity" (cited in Edwards, 1996, p.167) and a trigger for evaluative action (Edwards, 1997) because Williams (1990) commented that:

> *Every area of the school curriculum is value-laden to some extent...that within the classroom, the choice of lesson content reflects underlying judgments about what is thought to be worthwhile, effective, relevant and essential in the educational process.*
> (1990, Paper 4:2 cited in Edwards, 1996, p.172).

Edwards (1996) elaborated that values are "underlying judgments" in the way teachers "address pupils and each other, the way they dress, the language they use and the effort they put into their work (National Curriculum Council, 1992 cited in Edwards, 1996, p.177). Values are intrinsic in teachers' practices. Other researchers such as Flores, (2001); Freeman & Porter, (1989) described as "epistemic beliefs," an individual's beliefs "about the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge resides, and how knowing occurs" (Hofer, 2002, p.4). In practice, it is about teachers' assumptions of students, learning, instructional materials, and instructional design (Kagan, 1992) that underline everyday classroom teaching practices (cited in Song, et. al., 2007, p. 37). Having reviewed the implications of teachers' values and its impact on educational activity in particular, the adoption of an education innovation of reading

children's drawings with the Bloom's TEO adds vigour to the study. The study investigates with a pragmatic orientation to address real classroom issues by using "concrete, and specific, practical ideas that directly relate to the day-to-day operation of their classrooms" (Guskey, 1986, p.6). What is more spontaneous, direct and practical than children's drawings?

2.5 Conclusion

From the literature review a number of aims of the study have been generated:

- Firstly, the study aims to locate children's readiness to learn through iconic representation by comparing pre-and post-lesson drawings (Bruner, 1974).

- To identify the common threads of schemas or themes (Athey 2007; Nutbrown, 1999; Meade & Cubey, 2008; Bruce, 2004) known as spontaneous or prior knowledge in children's drawings "extending children's thinking with worthwhile curriculum content" (Athey, 2007, p.36).

- To identify the thinking processes involved in drawing (Anderson & Krathwhol, 2001; Jolley, 2009; Hope, 2008; Karmiloff, 1990 & 1992; Goswami, 1998;)

The study aims to use drawings to ask the key question of not only "what to teach when?" but "what would make sense to the learners and help them to learn?" (Hynes, 2010, p.137). The fact is what made sense to the teacher as "connecting one idea to another" in their lesson plans (Serdyukov & Ryan, 2008, p. 138) might not make sense to the children because children learn and think by connecting with their prior knowledge. Besides, children learn and think through analogical reasoning. The literature shows there is thinking-in-drawing and Bloom's TEO has the potential to elicit information from children's drawings to build cognitive skills, to inform teachers' curricular decisions, and to teach for understanding for conceptual change.

Chapter 3 Overview of Research Issues and Methodology of Research Components I, II, and III

3.1 Introduction

This is an overview chapter on issues and methodology used to address the research study. The purpose of the enquiry is "descriptive" which requires extensive previous knowledge to offer an accurate profile of the teaching and learning situation in Singapore and the significance of children's drawings with a multi-method approach (Robson, 1997). There were four different groups of research participants, mainstream preschool teachers and children (5 to 6 years); special needs teachers and children with special needs (5 to 6 years):

- 325 pre-/in-service teacher-questionnaire survey respondents;
- Face-to-face interview with 61 children (5 - 6years) from two separate preschools;
- Two class teachers from the two preschools who conducted the lessons;
- 25 children produced the 50 pre-and post-lesson drawings (11 and 14 sets of drawings from 5 and 6 years respectively);
- 140 pre-/in-service teachers evaluated the drawings with the Bloom's TEO drawing evaluation checklist;
- 18 mainstream and 22 special needs teachers participated in the test-run of the revised Bloom's TEO and Structure of Observed Learning Outcome (SOLO) combined taxonomies drawing evaluation checklists; and
- 34 pre-and post-lesson drawings of 17 high-functioning special needs children were evaluated with the revised checklist by their special needs teachers.

An overview of the research issues are discussed with the aim of setting the context to justify the chosen methodology and how the threats to validity, reliability and objectivity are addressed for each research component. The research began with approval granted by the School of Education Ethics Committee, Durham University.

3.2 Research Issue

The overarching research issue to address is "Can information in children's drawings (5-6 years) informs teachers' practices in the Singapore context?"

3.3 Research Design to Address the Issue

This is a brief overview of the research, classified into three components (see Table 3.1). Subsequently, each component is discussed in detail on the "what," "when," "how," and "why," and justifications for their use and how the data will be analysed whilst ensuring research principles - objectivity, reliability, validity and ethics were considered.

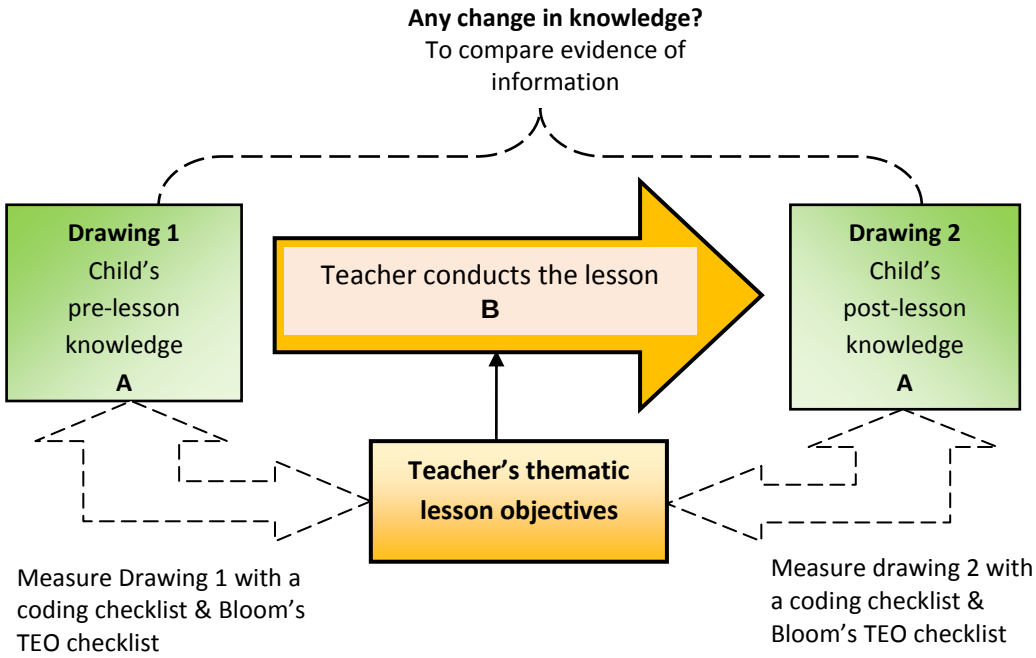
Table 3.1 An overview of the three research components

Research Component	Research Issue/ Multi-method Approach	Rationale
I	**Open-ended questionnaire survey:** "When should teachers teach new material?" **Face-to face interview:** "Why, sometimes children do not understand a teacher's lesson?	• To find out what is going on in classroom teaching today, in the real world by investigating factors that affect teaching decisions and teachers' preferred strategies used to find out about children's prior knowledge. • To examine children's (5 to 6 years) views on factors that affect their learning. • To compare and contrast between the survey respondents' views, theoretical views and children's views on the significance of prior knowledge to learning and teaching.
II	**Collation of children's pre-& post-lesson drawings from two preschools**	• To collect hard evidence for analysis to investigate whether there is information (of prior knowledge) in children's drawings that can inform teachers' lesson planning. • It aimed to investigate the quality and quantity of theme-related information with a coding checklist mapped to teacher's lesson's

		objectives. To cross validate whether learning has occurred after the teacher's teaching. In addition, to find out the extent of children's prior knowledge on what they already know about the theme. • For teachers to evaluate the drawings with the Bloom's TEO checklist and the revised SOLO-Bloom's TEO checklist in component III. To establish inter-observer agreement whether there is information in children's drawings and the types of cognitive processes induced by drawing.
III	**Frameworks testing:** **Whether the Bloom's TEO could function as a children's drawing evaluation checklist to elicit information of cognitive processes and content-knowledge from children's drawings** **1. Test-run the revised drawing evaluation combined SOLO-Bloom's taxonomies. checklist**	• To establish inter-observers' agreement whether there is theme-related information and cognitive processes induced by drawing. • To examine the quality of information encoded in terms of knowledge types and cognitive processes with the Bloom's TEO. • To establish whether the revised checklist could be generalized into other contexts (e.g. with special needs teachers and children).

Figure 3.1 summarized the A-B-A research design for research component II (Robson, 1993). Drawing 1 (A) to establish a base-line understanding of children's prior knowledge of the lesson's theme. The class teacher then implemented her on-going teaching intervention (B) as scheduled in the respective preschools. Thereafter, the children were asked to produce Drawing 2 (A) for the investigator to infer any causal relationship of change in knowledge.

Figure 3.1 Component II A-B-A research design



The A-B-A research design addressed the research issue by investigating any change in children's knowledge by comparing pre-and post-lesson drawings. To find out whether there is a match/mismatch between teacher's lesson objectives and what the children already know as read from the drawings.

3.4 Research Component I: Open-ended Survey Questionnaire

The questionnaire survey respondents were a cluster sampling of random choice comprised of 325 pre-and in-service teachers attending either Diploma or Bachelor full- or part-time studies mainly in Early childhood education in two different institutions in Singapore. It was a "convenience" sampling (Cohen & Manion 1994, p. 88), the researcher started the study with this sample where the phenomenon occurs and where the sample presented itself to the researcher at the institutions (Coyne, 1997). Thus, saving the respondents and investigator a great deal in time and money in travelling (Denscombe 1998). Moreover, there was a greater chance of high response rate of completed and returned questionnaires. Although cluster sampling provided a cross-section of samples worthwhile to the research, the nature of the clusters from education

tertiary institutions may have a tendency to give "educated responses" which are ideologically/theoretically driven. However, the threat of "subject bias" was compensated for by the large sample size of 325 respondents as well as the investigator's assurance of confidentiality and the choice of anonymity. Questionnaire survey strategy was adopted for its empirical research of a given point in time and the breadth of data to be collected (Denscombe, 1998). The aim of a one A4 size page questionnaire to investigate when teachers decide to teach new material falls under the "opinions" information required. Therefore, questionnaire survey (see Appendix C) was most suitable to capture the richness and complexity of the respondents' views (Denscombe, 1998). The advantages of questionnaires are economical, standardized questions and easy administration. However, its lack of "interpersonal factors" may result in the respondents misinterpreting the questions despite all attempts to make the wording of the questions as specific and clear as possible (Denscombe, 1998, p.105). See Table 3.2 a brief summary of component I.

Table 3.2 Research component I issue and justifications

Research Issue:	What are the factors that affect teachers' teaching decisions on when to teach new material?
Strategy Justification:	Open-ended questionnaire survey (Appendix C) Allows for the collection of standardized data such as "attitudes, values, beliefs and motives" of what informs teaching decision from a "relatively large number of individuals" from a known teaching population (Robson, 1997, p.124)
Samples/size/ Justification:	172 pre- and 153 in-service teachers respectively (total 325 respondents). Naturally occurring cluster in tertiary institutions, working or attached to various preschools in Singapore. Respondents' availability and co-operation were considered due to limited time and resources. The randomization of respondents was useful for generalizability of the study (Robson 1997).

Bryman's (1989) definition, "survey research entails the collection of data on a number of units and usually at a single juncture in time with a view to collecting systematically a body of quantifiable data in respect of a number of variables which are then examined to discern patterns of association" sums up the aim (p.104 cited in Robson 1997, p.124). Besides, Robson (1997) pointed out that data can be "collected over a period of weeks

or even months; simultaneous collection" befits the research design (p.124). The appeal of survey in its "quantifiable," "standardized" and "mass data simultaneous collection" on teachers' "attitudes, values, beliefs and motives" was an impetus to research component I (Robson, 1997, p.124). A survey was a strategy because it was a means of understanding the target teaching population's opinions on factors that influenced when teaching begins. However, the question on what x percentage of children with insufficient knowledge in hypothetical and real classroom situations for teaching to begin was later found extraneous to the key research question (see Appendix C). Despite the fact, it served a function of a "blind" assessment effect in which the respondents did not know which aspects of the data will be computed and used for analysis (Robson 1997, p.62). The hypothetical and real classroom situations questions helped to address the threat of "observer error" in case, the respondents gave only passing comments in either one of the situations (Robson, 1993, p.68).

A pilot phase of the questionnaire survey was implemented in June and August 2010 with post-graduate and diploma teachers in the United States and Singapore, respectively. Consequentially, an added question "How do you find out about the students' insufficient knowledge of the topic/theme/concept?" was needed to give insight into factors that affect teaching decisions and assumptions. What are the strengths and limitations of questionnaire survey? Robson (1997) cited some technological concerns about sampling, question-wording, answer-coding, and uninvolved respondents – these threats were addressed promptly in the pilot phase by getting input from the respondents to ensure the "questions mean the same thing to different respondents" (Robson 1997, p.127) offering "transparency (or accountability)," visibility and accessibility to all the participants (Hakim, 1987 cited in Robson, 1997, p.126). In addition, the investigator was available for face-to-face clarifications at the time of data collection.

The survey was then implemented with 325 teacher-respondents to provide explanations of what was described to get at causal relationships between the teachers' cited factors and the logic behind it (Robson, 1997). The possible threat of "uninvolved respondents" was met with the investigator's enthusiasm. Robson (1997) suggested that the presence of the investigator "encourages participation and involvement" to motivate the respondents to consider their responses carefully (p.129). Subsequently, the threat of "answer-coding" reliability was eliminated by establishing two other inter-coders

(see Appendix C1& C2) to ensure objectivity and validity in code constructs by sorting method in data analysis.

The analysis of the questionnaire survey "when should teachers teach new material?" mainly has two sets of qualitative data, the reasons or factors described and cited for when teaching begins and preferred strategies used to find out children's knowledge. In vivo coding method was employed because it preserved the voice of the respondents. The codes were word or short phrase or variations of "terms used by [participants] themselves" ([ ] added; Strauss, 1987, p. 33). In Vivo codes captured "behaviours or processes which will explain to the analyst how the basic problem of the actors is resolved or processed" (Strauss, 1987, p.33) and "help us to preserve participants' meaning of their views and actions in the coding itself" (Charmaz, 2006, p.55 cited in Saldana, 2009, p. 76). It was useful for "concept development and as possible dimensions of categories – i.e., the continuum or range of a property" (Saldana, 2009, p. 79). It was useful for conceptual categories development for a more robust analysis and view of the overall decision making factors affecting teaching decisions. The codes were derived from recurring words or short phrases the respondents repeatedly used in varied forms for example we could infer some form of "peer teaching" construct:

> *" … they would be able to create enough to share views with their peers."*
>
> *"Students with insufficient prior knowledge will be able to learn from their peers."*
>
> *"I feel that children learn best through their peers…get them to explain/teach it to their friends which would lighten my work load & promote interaction & peer learning between children."*

Therefore, the code derived was "peer teaching" – the respondents cited "*share views with their peers;" "learn from their peers;" "can pair up [children];" "children learn best through their peers*." The repeated pattern of speech showed how teachers took advantage of the disparity of knowledgeable and less knowledgeable students as an opportunity for peer learning to take place. Moreover, In vivo method facilitated the development of conceptual categories that made the most analytical sense because it is the representation of an idea that a theme is signifying (Charmaz, 2006). Marton's

(1986) phenomenography research approach designed to answer certain questions about thinking and learning is applicable in this study. The research method helped to map "the qualitatively different ways in which people [teachers] experience, conceptualize, perceive, and understand various aspects of, and [teaching & learning] phenomena in, the world around them" ([ ] added; p. 31). Table 3.3 presents examples of conceptual categories derived from the survey respondents' comments.

Table 3.3 Questionnaire survey deduced conceptual categories

Conceptual categories	Themes
1. Teachers' attitudes, values & beliefs in teaching and learning	• **Teachers' philosophy/values of what learning and teaching mean to them** *(e.g."I believe in education for every child and they deserve a fair chance to learn.")* • **Teacher's perceived role of responsibility** (e.g. *"It is my responsibility to teach.")*
2. Teachers' survival actions and strategies in the classroom	• **Teachers' ability to cope and manage students of differing learning abilities**. (e.g. *"I will still teach the whole class and pull out the 20% children in small groups make sure they understand the topic."* • **The "majority-wins" mentality in catering to the needs of the majority learners as a priority** (e.g. *There will be some children not able to cope in terms of cognitive development we should cater for the majority.")* • **Peer teaching opportunity** (*e.g. those who have the knowledge…will teach those who do not have the knowledge in small group.")*
3. Teachers' responding to system demand in teaching and learning	• **The school's curriculum and teachers' obligation** *(e.g."Whether the children have or do not have prior knowledge of the topics the lesson plan in the curriculum will still have to go ahead."* • **Time availability** *(e.g. "Insufficient time. Rush to move on to next topic.")* • **Child-interests/initiated learning** (e.g. "O*bserved to find out their interest...")*

In vivo method makes possible the development of conceptual categories to illuminate the recognition of the inter-relationship between themes fundamental to analysis. Table 3.3 elucidates the interrelationship between "teachers' philosophy/value of learning and "teachers' perceived role of responsibility" falls under the category of "teachers'

attitudes, values and beliefs in teaching and learning" it allows us to infer the significance of these factors impacting our respondents when seen as a category instead of isolated individualistic themes.

However, the disadvantage of In vivo as a method for small scale studies may limit the investigator's perspective of the data or the investigator may contribute to more conceptual and theoretical views about the phenomenon or process because sometimes the researcher say it better than the respondents (Saldana, 2009). This issue was resolved with the investigator conscientiously citing hard evidence from the respondents' comments to authenticate each conceptual categories and significances deduced to account for a shared voice between the investigator and the respondents.

The next section discussed the investigator's collation of empirical evidence by going into a childcare centre and kindergarten to collect evidence of information in children's drawings (5 to 6 years). To investigate if children's drawings have the potential to illuminate information of prior and spontaneous knowledge, and cognitive processes teachers could use to make teaching decisions with the goal of extending the learners' knowledge and thinking.

3.5 Research Component II: Children's Drawings

Component II was collation of raw data, children's drawings in accordance to the preschool's curricular theme at the point of visit. Ethics clearance was obtained by giving out a package containing consent forms and research information to the preschool's person-in-charge (usually known as "principal/ supervisor"), the participating class teacher with signed and returned parent consent forms (a clause clearly stating that the participants may withdraw from the participation without any repercussion was highlighted to the participants). Appendix C3 package was given at least one-month ahead of the investigator's visit. A total of three half-day visits by the investigator were made to ensure internal validity by observing and interviewing children and teachers directly to watch and listen to what they say in real classroom practices and how drawings were made and lessons taught. The logic for observation is summed up by Robson (1997) "How do we know what the behaviour would have been like if it hadn't been observed?" (p.192). Thus, the investigator played a "participant-as-

observer" role with openness and interest (Robson, 1997, p.197) to establish close relationships with the children and teachers considering possible "stranger anxiety" effects on the 5-6 years children and to dissipate the teacher's anxiety of participating in a research study to help them to stay as natural and comfortable as possible. Such a role was necessary so that the children will "view [the investigator] as something akin to a teacher…, helping and caring staff… and not surprised to be quizzed" by the investigator (Robson, 1997 p.197). With this aim, the investigator managed to document the lesson developments, and children's drawing commentaries in a natural setting. The meaning of the observation was set by the teacher's planned lesson's objectives for the session, thus, the threat to "please or placate the 'important' observer" was minimized over a three-day visit with the added advantage of the participants being "so accustomed to the presence of the observer that they carry on as if she were not there" (Robson, 1997, p. 197 & 191).

The research participants were 25 children (5 to 6 years) who produced pre- and post-lesson drawings significant to the research study in a cluster sampling of two different groups of children from two preschools with thematic curriculum approach (a representation of an approach adopted by many preschools in Singapore) and income groups but not based on expertise in drawings. Many researchers had proven that income groups had implication on the availability of learning opportunities thus, a child's prior knowledge. The principals and teachers' expressed desire for professional development through their participation in the research was also taken into account because the successful implementation of research was dependent on teacher's cooperation and availability for follow-up interviews due to limited time and resources.

Why investigate 5 - 6 years children's drawings? Basically, preschoolers of this age range show a higher and more consistent representational quality (Butler et al. 1995; Gross & Hayne, 1998, 1999 in Jolley, 2009) and the ability to provide verbal narrative to aid our interpretation of their drawings (Jolley, 2009). Why use children's drawings as a strategy to study its potential for extending learning and teaching? Firstly, I have a special interest in the study of children's drawings, having witnessed many young children invested so much focus and serious thinking to produce a drawing. Indeed, children's drawings are pictures of learning (Drummond, 2003) loaded with meanings constructed by the child to record experiences and observations of their environment (Matthews, 1999 & 2010; Athey, 1990, Jolley, 2009, Wright, 2010). Newton (2000) maintained that "with the younger children or those whose writing skills are less well

developed a lot of information can be obtained from analysing the pictures they produce" underlies the logic (p. 253). I am driven by the quest to find out how best to make use of children's drawings in daily classroom practices to support teachers' teaching and children's learning. The instruments to evaluate the children's drawings were coding checklists mapped to the teacher's lesson objectives and Bloom's taxonomy of educational objectives (TEO) to identify content-knowledge and cognitive processes induced by drawing (this is discussed in detail in research component III). Table 3.4 summarizes component II:

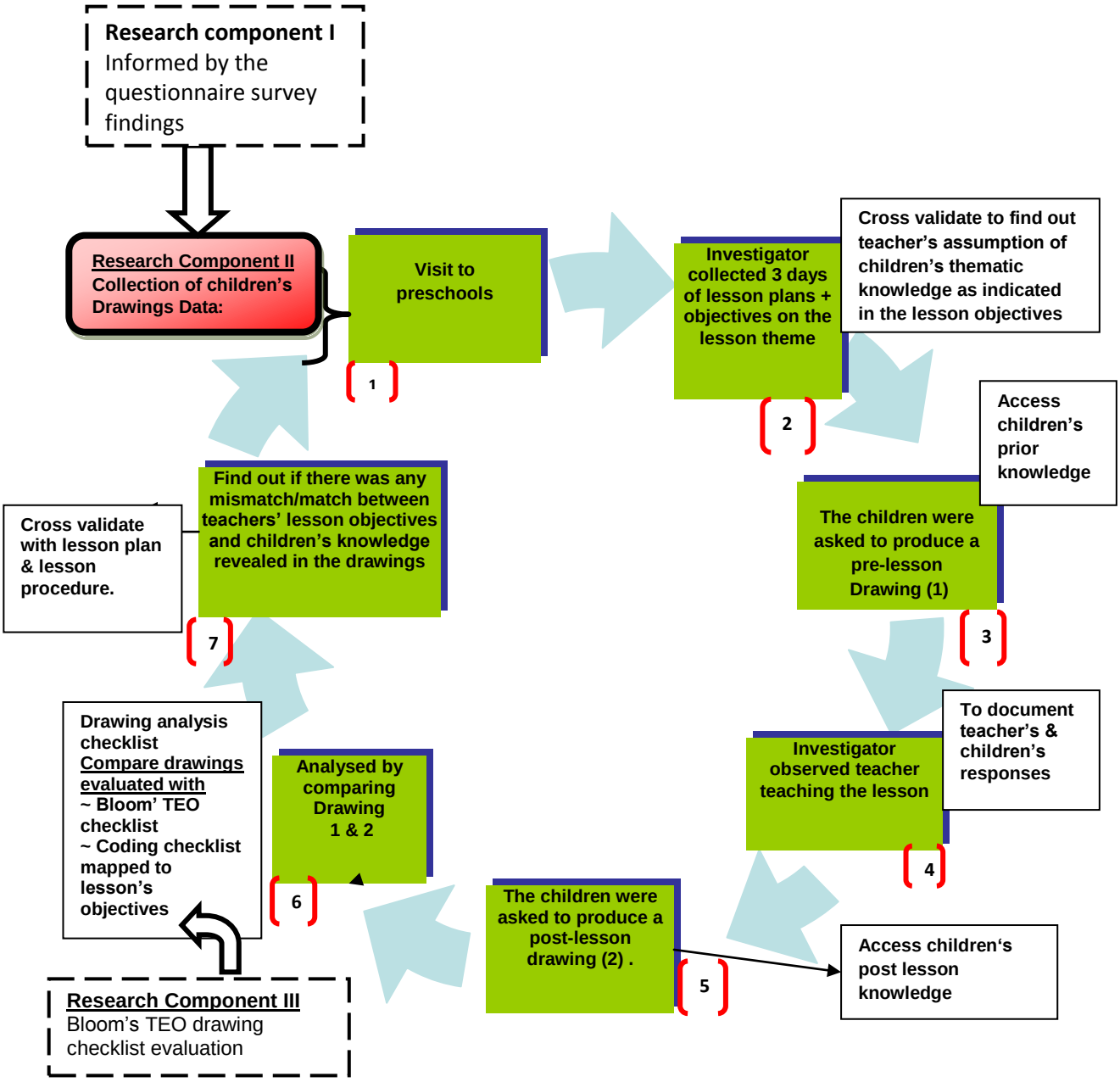
Table 3.4 Research component II issue and justifications

Research Issue:	What evidence of information in children's drawings that could inform teachers' practices, in particular for lesson planning.
Strategy Justification:	The participant-as-observer method • The actions and behaviour of children and teachers required *direct* observation to watch what they do and say in order to describe, analyze and interpret the qualitative data of component II.
Samples/size and Justifications:	14 six+ years and 11 five+ years children (total 25 children) • Naturally occurring clusters from two different preschools. Thematic curriculum approach (See chapter 2 Early childhood education curriculum in Singapore). • The familiar context of the classroom with items of resources that the teacher used to teach the thematic concepts helped to trigger children's memories of what was taught prior to the post-drawing.

Research procedure:	1. Investigator briefed the class teacher on the research procedure. 2. The teachers submitted 3-day lesson plans to the investigator. The teachers were interviewed to understand "what, how and why" the lesson objectives were set with the aim to examine if the teacher's assumptions of children's sufficient/insufficient knowledge of the taught theme could be verified through the drawings.  **Figure 3.2 Research drawing materials for the children** 3. The children were given 2 to 5mm thickness of washable markers and 120 gms A4 size papers for drawing (see Figure 3.2). 4. Children were asked to draw (40 to 45 mins.) before the teacher taught lesson to establish a base-line performance of theme-related prior knowledge. Drawing theme was based on the lesson's objectives set for the session (e.g. if the teacher's lesson objective was "*children will know how to spell and name wild animals"* then the drawing instruction given was "draw what you know about wild animals; name and spell them." 5. Teacher conducted the lesson as planned. 6. Children were asked to draw after the taught lesson (40 to 45 mins.) to compare and contrast any differences in knowledge encoded between the pre- and post-lesson drawings. To observe reliability, the same instruction given in pre-lesson drawing was repeated for the post-lesson drawing. 7. After the drawings were completed, the investigator interviewed individual children for content and meanings. The child's comments and descriptions were annotated on the child's drawings.

The research procedure is summarized in Figure 3.2.

Figure 3.2 Component II: Children's drawings collation research procedures



In component II the investigator was "observing through participating in activities, the observer [investigator] can ask members to explain various aspects of what is going on" such as meanings of the drawings and teacher's rationale for a lesson procedure (Robson, 1997, p. 197). The threat of "Hawthorne effect" in which special attention/treatment may change the children's behaviour was negligible except for the research drawing materials provided that initially aroused a little excitement otherwise,

the children very quickly got used to the materials (Roethlisberger & Dickson 1939 in Robson, 1997, p.84). Moreover, the "testing" effect as a result of practice and experience in producing a number of pre-/post-lesson drawings was offset by the different lesson topics and objectives set by the class teachers over a three-day visit (Robson, 1997, p.70). Having addressed these potential threats, the purpose of component II was to describe and capture qualitative and descriptive statistical data on content-knowledge and cognitive processes induced by drawing to inform teachers' practices by investigating:

1. What is the mean information difference (if any) between pre-and post-lesson drawings?

2. What is the children's prior knowledge of the taught theme?

3. What to teach to extend children's prior knowledge – by studying the drawings' general recurring or unique pattern, schema, themes, interests, relationships and analogies as represented.

Component II is linked to component I by providing empirical evidence of children's prior knowledge to verify the survey respondents' view of prior knowledge to teaching and learning. It is also connected to component III to establish inter-observer agreement whether there is information encoded in the drawings evaluated with the Bloom's Taxonomy of educational objectives (TEO) checklist. However, to add strength to the pre-test / post-test single group design threat phenomenon (Robson, 1997), the investigator examined two specific sets of drawings, the "wild animals" and the "water cycle" for qualitative and quantitative analysis, interpretation and checklist evaluation (see Table 3.5).

Table 3.5 Qualitative and quantitative analysis of the drawings

Qualitative approach in drawing analysis	Quantitative approach in drawing analysis
1. Construct-coding of recurring schema/patterns/interests represented. 	1. By computing the number of codes - recurring schema/patterns/ interests as represented.
1. Construct-coding of *unique* schema/pattern/interests represented. 	2. By computing the number of codes - unique schema/pattern/interests as represented.
2. Categorize the construct-codes of the class e.g. "natural cycle/man-made cycle" pattern. 	3. By computing the number of children in a class demonstrating similar idea of representations.
3. Categorize the construct-codes of *unique* concepts e.g. analogical reasoning. 	4. By computing the number of children in a class demonstrating varied forms of the unique idea as represented.
4. Translate the lesson objectives by designing a coding checklist to measure the extent of the objectives being met by individual child. 	5. By computing the number of items on the checklist to examine the percentage of children having met the lesson's objectives.
5. Use Bloom's TEO drawing evaluation checklist to determine the content-knowledge and cognitive processes. 	6. By computing the mean difference between the pre-and post-lesson drawings based on individual cognitive criteria as rated by the teacher respondents.

This procedure is made robust with hard evidence supported with annotations of children's descriptions of their drawings. The next section discussed component III, the Bloom's TEO as the framework to guide teachers to read children's drawings for information.

3.6 Component III: Evaluation of Children's Drawings with the Bloom's Taxonomy of Educational Objectives (TEO) checklist

Research component III examined information of children's content-knowledge and underlying cognitive processes deduced from wild animals and the water cycle thematic drawings. This study postulates the Bloom's TEO may be the descriptive framework that could help Singapore teachers to recognise and elicit underlying thinking processes evidenced in the 14 sets of "wild-animals" and 11 sets of the "water-cycle" pre- and post-lesson drawings respectively. The investigator added written examples for each Bloom's cognitive criteria/sub-criteria drawn from evidence found in children's drawings studied over the years to put together the Bloom's TEO into a checklist applicable for evaluating children's drawings in this study (Appendix A1).

Other researchers like Flavell (1987), Trautner and Milbrath (2008) had applied taxonomy of metacognitive abilities to investigate children's drawings. They discovered at least two types of knowledge in the dealing with metacognition, namely:

1. "Factual knowledge" (knowing what) in a particular content domain, which Flavell identified as "person and task variables" in his framework.

2. "Procedural knowledge" (knowing how) to organize cognitive activities to solve problems and take action (Trautner & Milbrath 2008, p.9) which Flavell proposed as "strategy variable."

Of course, children demonstrated more than just "factual" and "procedural" knowledge in their drawings**,** in fact**,** it is *loaded* with meanings (Matthews, 1999). Anderson & Krathwohl, (2001) in their revised Bloom's TEO proposed two additional domains "conceptual" and "metacognitive" knowledge which may be crucial to illuminate the meanings loaded in drawings. This study of the Bloom's TEO as an unprecedented instrument to analyze children's drawings is new in the study of the psychology of children's drawings. The appeal of the Bloom's TEO lies in its clear descriptive classification of the types of knowledge and cognitive processes embedded in learning which is useful to support teaching; the focus of the study. According to Anderson & Krathwohl (2001) the TEO can be used to "develop learning objectives, plan instruction, design assessments, and align these three activities" (p. XXIV). The

research embraces these three aspects as delineated clearly in research component I, II and III. Children's drawings in component II demonstrated their potential as a tool for planning lesson objectives by revealing features of children's prior knowledge and cognitive processes. In other words, the Bloom's TEO has the potential as an instrument to study children's drawings for planning instruction. However, the Bloom's TEO is criticized for its linear hierarchical proposition that thinking skills is acquired from lower to higher order and its trivialization of knowledge as mere rote recall and recognition (George, 2004, p.78). On the contrary, the Bloom's TEO in fact "has forcefully made an important point: Much of our teaching and testing is aimed at low-level objectives" (see Chapters 5 & 6 & 7; George, 2004, p.79). Singapore teachers are not aware their teaching is aimed mostly at lower thinking order unless they are alerted to the underlying thinking processes induced by drawing made explicit by the Bloom's cognitive processes. See Table 3.6 an overview of component III:

Table 3.6 Research component III issues and justifications

Research Issues:	**What information of content-knowledge (prior and spontaneous knowledge) and cognitive processes are evidenced in the 50 drawings?** 1. To establish inter-observer agreement whether there is theme-related information encoded in the drawings. 2. To examine the quality of information encoded in terms of knowledge types and cognitive processes. 3. To quantify the mean information difference between pre-and post-lesson drawings after the teacher's lesson.
Strategy Justifications:	**The Bloom's TEO drawing evaluation checklist** • The strengths of a checklist rating: Standardized data, mass data collection, easily quantifiable. • Its limitations: hard to achieve reliable inter-raters' agreement when there are more than two raters. It was mainly due to an independent variable - the raters' subjective interpretations and background (education/experiences) interfering with their judgments. • However, to get around it a mean score and standard deviation score would suffice to give an indication of the children's performance in terms of more or less knowledge encoded in the pre- or post-lesson drawings.

Samples/size/ Justifications:	**140 pre-/in-service teachers** • Opportunistic sample that presented itself in naturally occurring clusters in teacher training tertiary institutions. • The study addresses classroom practices phenomenon where the teacher-sample operates. In other words, it is a study of children's learning for teacher.
Research procedure:	1. The investigator conducted a PowerPoint slides (60 mins) on "How to use the Bloom's TEO to evaluate children's drawings," showing various drawing-samples to match the different cognitive processes indicated in the taxonomy (Appendix G1). 2. The investigator then distributed the checklists and drawings of "wild animals" and the "water cycle" at random without telling the participants whether the drawing he/she received was a pre- or post-lesson drawing to ensure internal validity of a blind assessment (Robson 1997). The participants had the choice to rate the drawing as an individual or in pairs or small groups of three (as requested). 3. The investigator was present to provide any clarifications needed during the evaluation process.

Component III aimed to empirically ascertain whether there is any change in knowledge between pre-and post-lesson drawings. The hypothesis is, if children's drawings captured information of prior and spontaneous knowledge, then if the teacher teaches not building on their prior knowledge there will be little or no change in knowledge indicated in the post-lesson drawings. In addition, to test whether the Bloom's TEO drawing evaluation checklist could elicit specific, measureable theme-related information and cognitive processes that characterize learning and thinking. Component III was designed to address possible threat of "experimenter expectancy effects" by engaging 140 inter-observers/teachers to rate those drawings for information to counteract against investigator's bias findings (unwittingly) and to provide support for the research hypothesis (Robson, 1997, p.82). "Observer error" due to tiredness or being overstretched was offset with a good sample size to achieve a probabilistic truth with Statistical Package for the Social Sciences (SPSS) analytical tool (Robson 1997). In addition, the randomization of ratings between the pre-/post-lesson drawings offset the threat of "observer bias" of rating the post-lesson drawings more highly than the

pre- (the bias assumption that after teacher's teaching it had increased or made a difference in children's learning) (Robson, 1997, p. 68).

3.6.1 Data analysis – using SPSS quantitative analysis of an average model to find change in knowledge between pre-and post-lesson drawings.

Table 3.7 The Bloom's TEO checklist ratings computation procedure

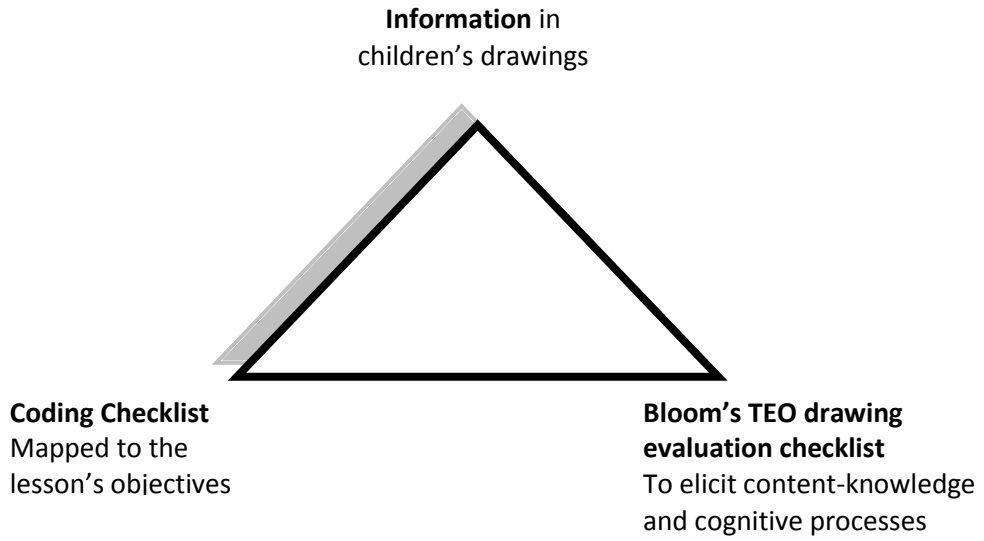
1. Investigator keyed into SPSS the 140 respondents' ratings of the 50 drawings. That will compute to about three respondents per pre-/post- drawing (although, some respondents had rated more than one drawing).

2. The cognitive criteria ratings per pre-/post-lesson drawings were added up according to Time 1 (pre-lesson Drawing 1) and Time 2 (post-lesson Drawing 2).

3. The mean difference of Time 1 and Time 2 provided the descriptive statistics good enough to show a general pattern between pre and post-lesson drawings but not to make inferences for statistical significance.

The statistical analysis illuminated the construct validity of the Bloom's TEO checklist in measuring content-knowledge and cognitive processes elicited from the children's drawings. This was then cross-validated and corroborated with findings from the coding checklists against the 140 respondents' Bloom's TEO checklist ratings. Figure 3.3 shows "between methods of triangulation" (Cohen & Manion, 1994, p.236) between the coding checklists mapped to the teacher's lesson objectives and the Bloom's TEO for eliciting information from the drawings. Basically, the aim was "to map out, or explain more fully, the richness and complexity" by evaluating drawing-information from more than one standpoint by making use of quantitative and qualitative data (Cohen & Manion, 1994 p.233).

Figure 3.3 Between methods of triangulation to verify information encoded in the children's drawings



The respondents' feedback (see Appendix G4) on the efficiency of the drawing evaluation checklist was noted and revised accordingly by combining the Bloom's TEO with Biggs & Collis (1982) Structure of Observed Learning Outcome (SOLO) to provide information on the quantity and quality of information encoded. The revised checklist was test-run with 18 mainstream preschool teachers to evaluate at random drawings of wild animals and the water cycle. In addition, 22 special needs teachers used the revised checklist to evaluate 17 high functioning special needs children's pre- and post-lesson drawings to test for generalizability. Both the implemented (with 140 teacher-respondents) and the revised drawing evaluation checklists provided robust empirical evidence of children's theme related content-knowledge, spontaneous knowledge and cognitive processes information that could be used to inform teaching practices to extend children's thinking and learning.

3.7 Conclusion

Research principles and ethics were sensitively observed in the naturalistic enquiry of whether information in children's drawings can be used to inform teachers' practices. Possible research threats were recognised and addressed to the best of the investigator's ability at different phases of the research study. Internal and external validity were addressed rigorously using multi-method approach to make the study believable and trustworthy enough to be generalized to benefit the education community (Robson, 1997).

Chapter 4 Research Component I
Methodology, Questionnaire Survey Findings and Discussion

The research study design had three components, I, II and III. Each component was planned and discussed in separate chapters with reference to Chapter 3, the principles of research issues and methodology. Thus, each chapter had a strong emphasis on reporting on findings and discussions. This chapter begins by reporting on research Component I.

4.1 Component I Questionnaire Survey: "When should teachers teach new material?"

4.1.1Research context.

The main focus of the research aimed to investigate whether evidence of learning encapsulated in the children's drawings can inform Singapore teachers' practices. The research nature of component II required individual children to draw what they know about a lesson's theme before and after a lesson. While the logic of component I was first to examine factors that affect Singapore teachers' teaching decisions on when to teach new material in particular, teachers' views regarding children's prior knowledge to learning and teaching, and teachers' preferred strategies employed to find out about children's sufficient/insufficient knowledge. Component I set the perspective for components II and III. The respondents had to complete an open-statement "I chose this percentage because…" to offer research insights into teaching values and beliefs. The next question, "how do you find out about the students' insufficient knowledge of the topic/theme/concept?" aimed to understand the different strategies Singapore teachers devised to assess the learners' knowledge. The questionnaire had set up two situations "hypothetical" and "in practice" for the teachers to respond (see Appendix C). Of relevance to the discussion were "in practice"

situation findings because the research value concerned real world practices in the context of Singapore teaching pedagogy. Information of teachers' values and preferred strategies are useful in helping to locate the plausibility of the study's proposed innovative teaching strategy of using information in children's drawings to inform teachers' practices in lesson planning. (See Appendices D – D11 raw data of the teachers' responses). Invariably, this led to face-to-face focus group interviews with 61 children (5 - 6 years), 25 girls and 36 boys from a childcare centre and kindergarten to understand their views about learning from children's perspective (see Appendix D12).

4.2 Research Component I Aims

1. To find out what is going on in classroom teaching today, in the real world, by investigating factors affecting teaching decisions and teachers' preferred strategies used to find out about children's prior knowledge.
2. To examine children's (5 to 6 years) views on factors that affect their learning.
3. To compare and contrast between the survey respondents' views, theoretical views and children's views on the significance of prior knowledge in learning and teaching.

4.3 Sampling Procedures

The convenience samplings were found attending classes in institutions in the west and central Singapore. The investigator briefly explained how to fill in the questionnaire survey to an average class size of 25 to 40 teachers in a classroom. She was also present to respond to any questions and assured the respondents of confidentiality. The respondents then quietly read the questionnaire survey, filled in their responses and returned them about 30 minutes later.

4.4 Participants' Characteristics

It was a non-probability convenience sampling (Cohen and Manion, 1994) where the respondents were found in naturally occurring clusters in teacher training tertiary institutions. There were 325 survey-respondents (172 pre-service and 153 in-service teachers), aged 19 to 62 years of different ethnicities, Chinese, Indians, and Malays representative of Singapore's multi-racial society with a minority from other nationalities(e.g. Philippines; Myanmar). There were 318 females (151 in-service and 167 pre-service) and 7 males[1] (5 pre-service and 2 in-service). Thus, the statistical generalization was limited to teacher population. The teachers' working experience was a minimum of 0 to a maximum of 360 months with an average working experience of 37 months. They were from diverse backgrounds ranging from mid-career switch, fresh 'O' levels or diploma graduates, current school teachers, part- or full-time students juggling different roles as father, mother, student, daughter, wife, husband in the course of their professional trainings in Early childhood education.

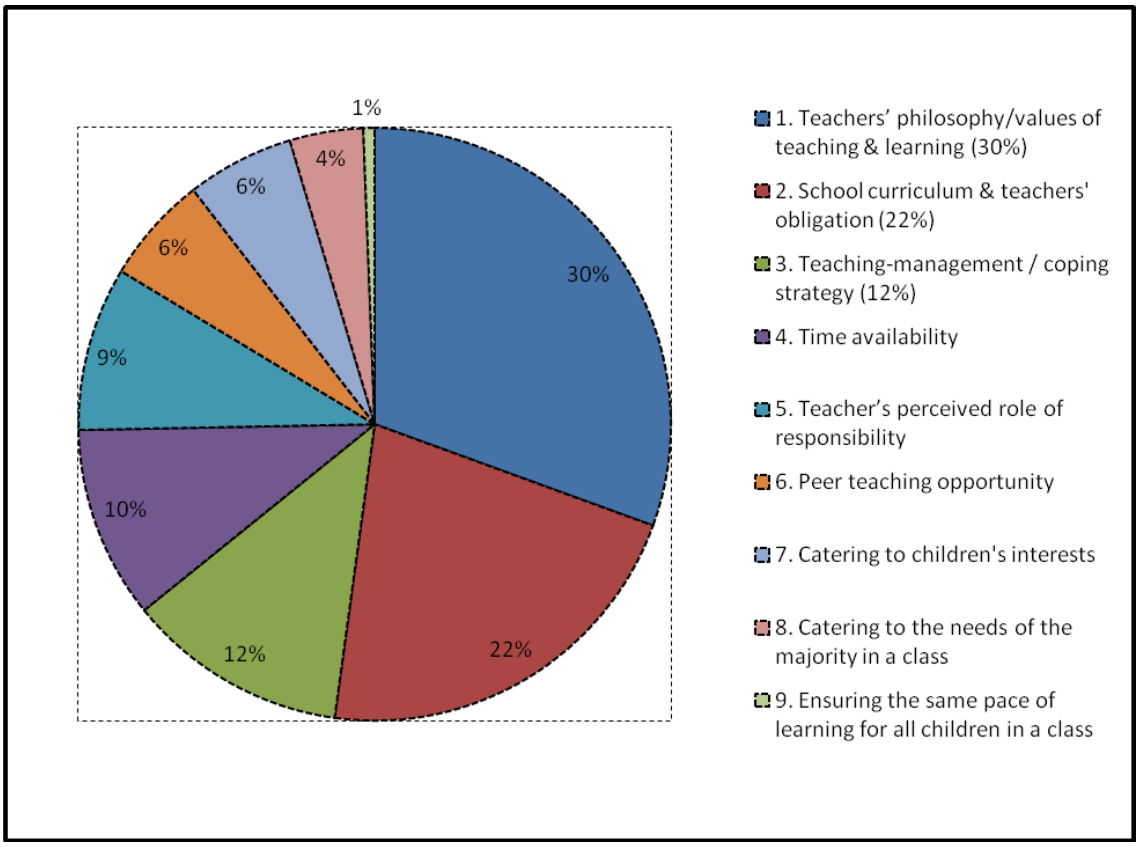
4.5 Findings

4.5.1 Teachers' views on factors that affect their teaching decisions.

The teachers gave reasons offering insight into their tacit knowledge of what the teaching craft meant to them (George, 2004). These codes were derived from recurring and consistent comments expressed repeatedly in varied forms using manual In vivo coding method because it retained the respondents' voices (see Chapter 3). The survey findings showed nine key factors hierarchically ranked that affect Singapore teachers' decisions of when new materials are taught (see Appendices D1- D11; Figure 4.1):

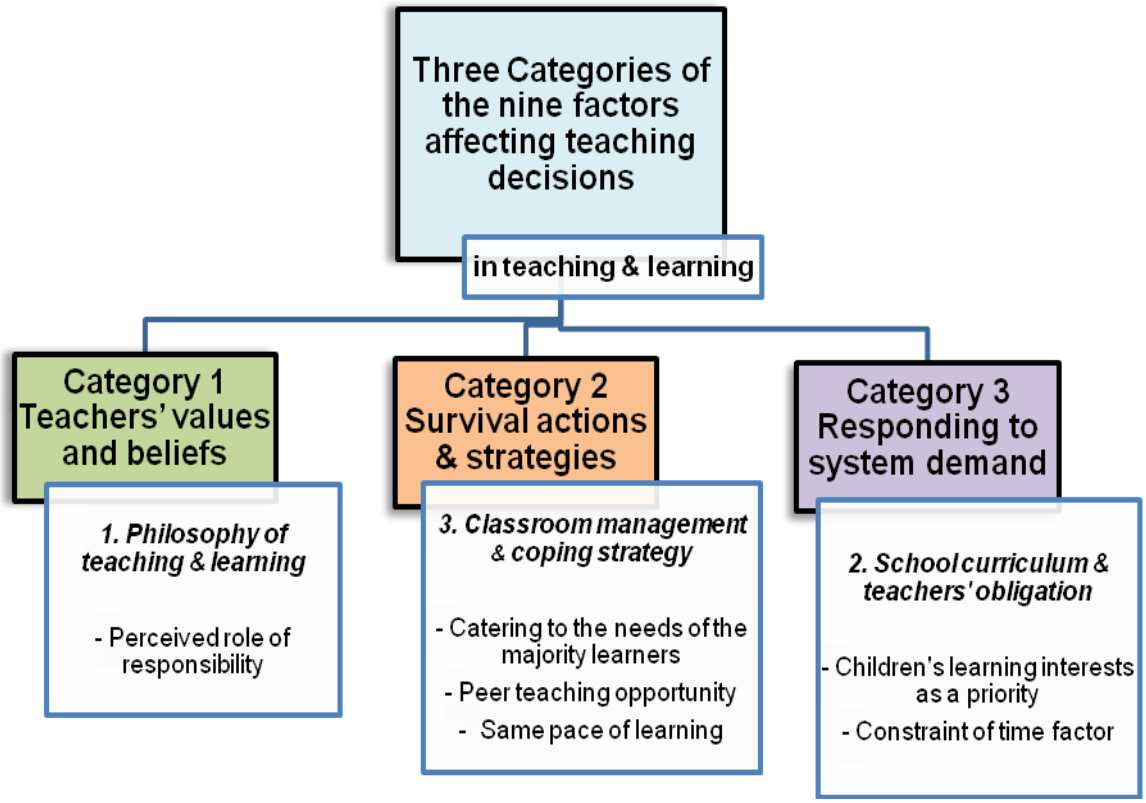
[1] In Singapore the male teacher population in preschool sector was less than 0.5% as reported in the media, May 2011 out of 5,600 preschool teachers only 26 were male (Ministry of Community Youth and Sports, 2011).

Figure 4.1 Factors that affect Singapore preschool teachers' teaching decisions



These nine factors that influence teaching decisions were truncated into three conceptual categories to reflect the complexity of the system teachers operate in (see Figure 4.2). Each of the first three factors cited by the 325 teacher-respondents was found in each category: category 1) Teachers' values and beliefs; 2) Survival actions and strategies; and 3) Responding to system demand, respectively. These are elements that all contained teaching decisions. These categories captured the lived experiences (Marton, 1981; Plummer, 2008) of teachers teaching in a real world (Robson, 1997) sandwiched between their core beliefs, surviving in day-to-day classroom demands and professional responsibility in responding to the demands of a school curriculum. In reflexive research it was important to let the data speak to the investigator (Guba & Lincoln, 2008). The results speak of the struggles these Singapore preschools teachers were subjected to (see Figure 4.2).

Figure 4.2 Three conceptual categories and factors that influence teaching decisions



The discussion focuses on the top three factors within the scope and cogency of the research issue:

1. Teachers' philosophy/values of what learning and teaching meant to them
2. The school curriculum and teachers' obligation
3. The ability to cope and manage students of differing learning abilities

The discussion is informed by Marton's (1981) phenomenography discourse of the second-order perspective in reporting the real world descriptions by real people in their lived experiences. Factor one, teachers' strong sense of belief and value of what learning and teaching (education) meant to them was the key deciding factor in making teaching decisions (see Figure 4.1).

4.5.2 Factor one: Teachers' philosophy/values of teaching and learning.

The 325 respondents' intuitive judgement that "teacher's philosophy/value of teaching and learning" was the deciding factor may be correct because much of teacher's skill and knowledge of good teaching is tacit knowledge of the teaching craft horned over the years cannot be unfounded (George, 2004). The majority of the teachers believed that every child must be given "*equal opportunity in education;" "no one should be left behind;"* and most children possess prior knowledge. The teachers' key argument for learning was due to the fact that knowledge is important, thus, all children should be given equal opportunity to learn. But this raised the question "Whose knowledge is important?" - The planned curricular knowledge or the children's knowledge that they bring to the classroom? Several comments made about meaningful teaching were to teach things that a child did not know. So, there were at least two different views: meaningful learning depends on a child's prior knowledge while effective teaching is to teach things that are new to the child, in order not to bore the child with what he or she already knows.

Table 4.1 Factor One: Teachers' philosophy/values of teaching and learning

[1]Factor One: Teachers' philosophy and value of teaching and learning

Inductively Developed Code Categories

Category	Code Category	Key terms	Characteristic Code 1 responses
Q2. Why the chosen percentage? **Code one: Philosophy/value of teaching and learning**			
PT1	**Philosophy of teaching**	"*Believe;"* *"More meaningful."*	*"Education is for every child;"* *"No one should be left behind;"* *"More meaningful to teach what the children do not know than to teach them what they already know;"* *"I believe children should be given opportunities to learn new concepts."*
PL2	**Philosophy of learning**	*"Unique;"* *"Prior knowledge;"* *"Process of learning."*	*"Each child is unique;"* *"Each with different prior knowledge thus acquire knowledge differently;"* *"Children learn best when they see and feel new materials."*
PTL	**Philosophy of teaching and learning**	*"Believe;"* *"Prior knowledge;"* *"Fair to all."*	*"Knowledge is important;"* *"I believe children without prior knowledge can try to pick up new concepts;"* *"We have to push children to the limit;"* *"All students have the right to be educated regardless of whether they know/do not know the concept."*

[1] The American Psychological Association Publication Manual (APA, 6th ed., 2009) suggested format is used to report on the three key factors.

Figure 4.3 summarizes the teachers' pedagogical beliefs and views on prior knowledge and its implication for teaching and learning.

Figure 4.3 Teachers' philosophy/value of teaching and learning: Nine sub-themes

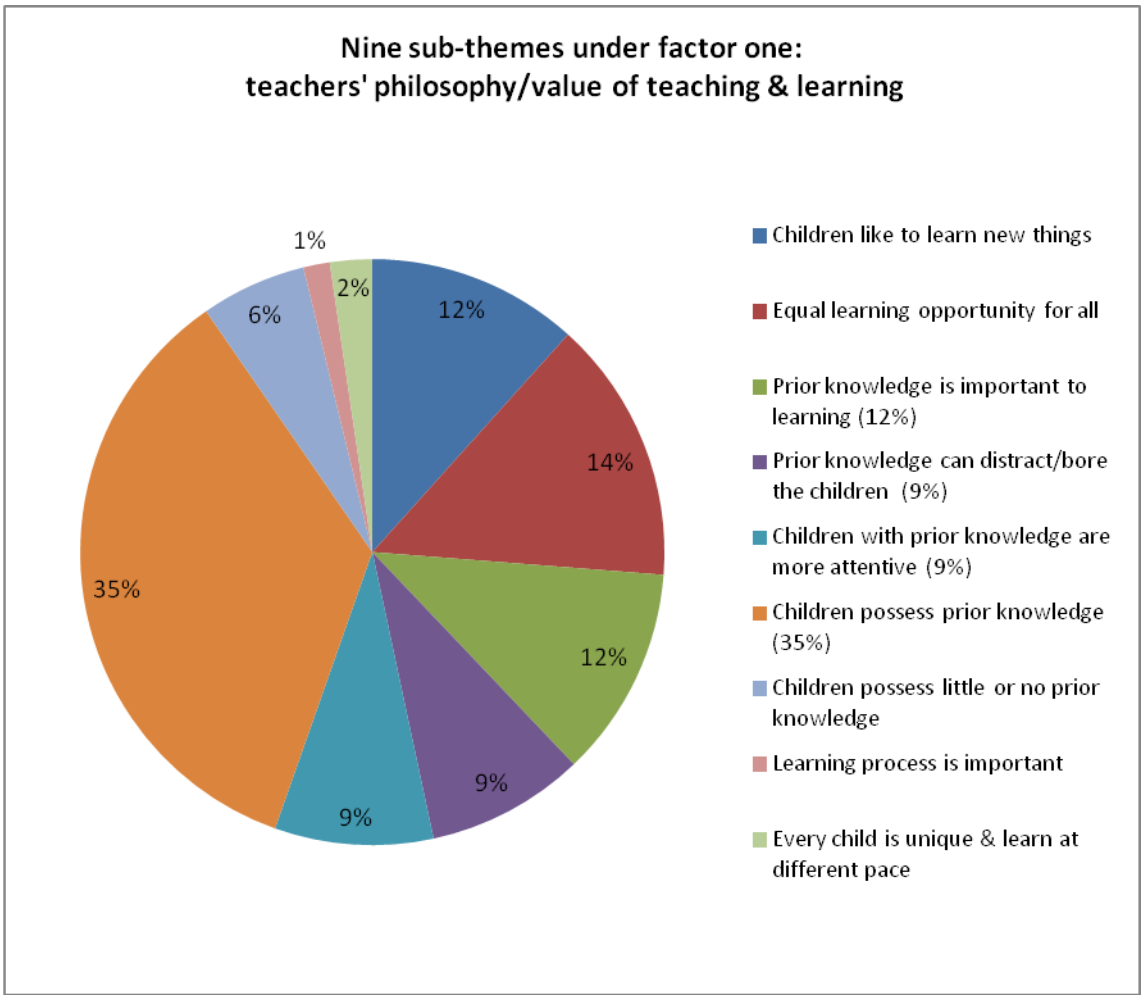


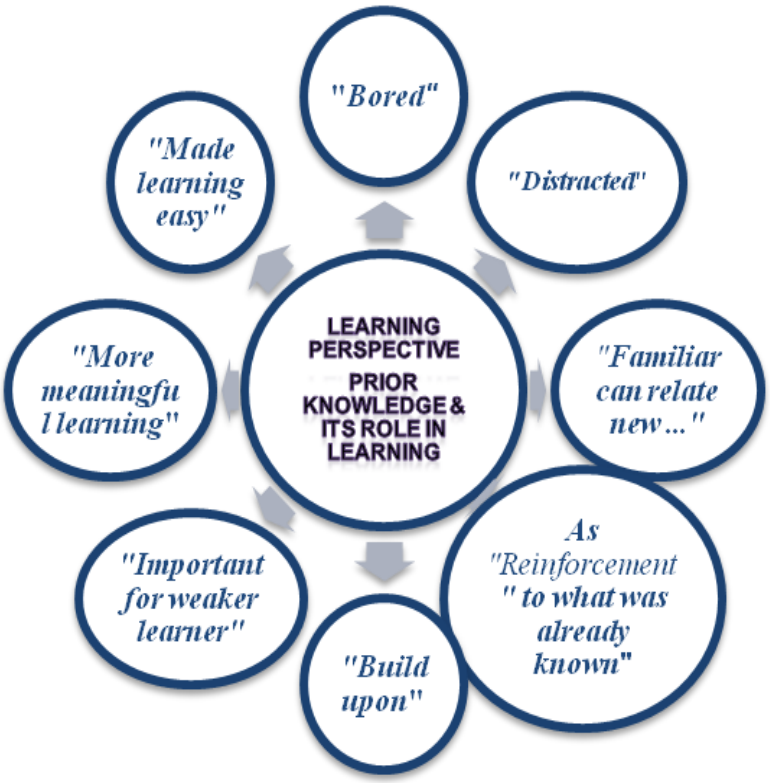
Figure 4.3 showed a high 35% Singapore teachers believed children possess prior knowledge in comparison to 6% claimed that children do not possess prior knowledge. Intriguingly, only 12% felt prior knowledge was significant to a child's learning. Some 9% teachers viewed prior knowledge more of a "distraction" assuming that children who were already familiar with the taught material may become bore. While another 9% saw the lack of prior knowledge actually "contributes" to children's learning by claiming that they are more attentive and interested to learn new material. These diverse views on the role of prior knowledge were conceptually categorised into two different perspectives:

Learning perspective (see Figure 4.4):

- Prior knowledge and its implication on learning: Teachers assumed that prior knowledge could "bore or distract" children from learning due to over-exposure and over-familiarity with the material resulting in boredom.

- While some teachers claimed prior knowledge could contribute to children's learning by making learning *"easier"* and *"more meaningful."* They perceived prior knowledge as a good starting point equipping *"weaker children"* with some fundamental knowledge to make sense of the new material.

Figure 4.4 Prior knowledge: Learning perspectives



Teachers' definitions of prior knowledge:

1. *"Background knowledge"*
2. *"Something they already knew"*
3. *"Basic knowledge*"

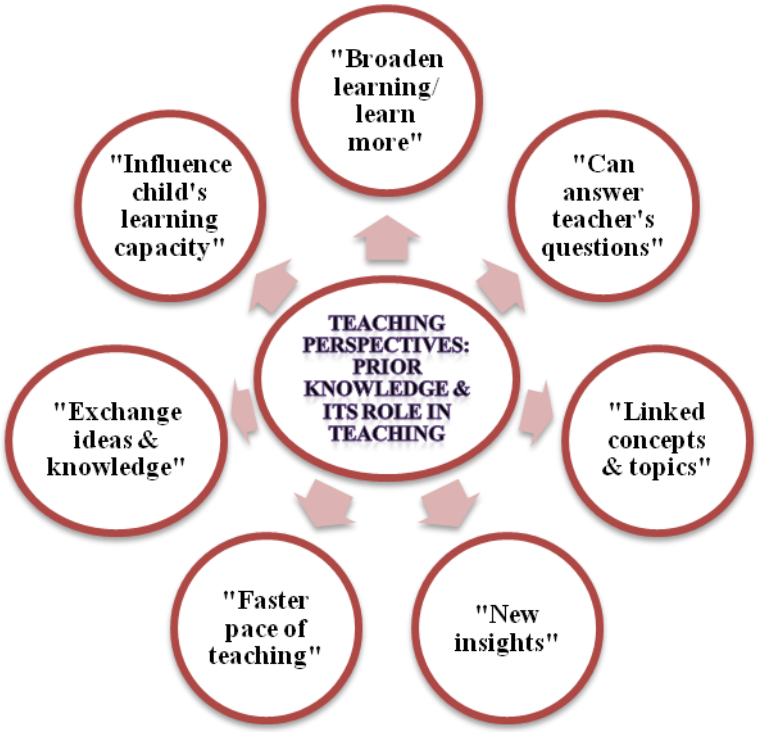
Teachers' perceived sources of prior knowledge come from:

1. *Enrichment programmes*
2. *Tuitions*
3. *Acquired in early stage of development*

Teaching perspectives (see Figure 4.5):

- Coming from a teaching perspective these teachers viewed children's prior knowledge is an advantage to teaching. Children with prior knowledge could assist teachers to help the less competent ones; teachers may increase the pace of teaching or develop new insights and perspectives by building on what the children already know by tweaking their lesson's objectives and/or lesson's directions.

Figure 4.5 Prior knowledge: Teaching perspectives



Teachers' comments on the advantages of prior knowledge to teaching

1. "*Help to teach others.*"
2. *"Change objective & be flexible."*
3. *"Emphasize a different perspective."*
4. *"Stretch children's thinking."*

The findings showed Singapore teachers, who had cited philosophy/value of teaching and learning as a decisive factor in making teaching decisions were generally confused about the role of prior knowledge play in teaching and learning. It had flagged out some real world issues of 18% (9% + 9%) Singapore teachers' rather vague understanding of the significance of prior knowledge; moreover, another 6% teachers claimed that children do not possess prior knowledge. This is a concern because it implied a possible lack of teaching for understanding because teaching is disconnected from children's prior understanding (see Chapter 2 theoretical views on the significance of prior

knowledge to learning). It also suggests a possibility of teachers in Singapore lacking a strategy to assess children's prior knowledge for them to comprehend the full meanings of what it means to take children's prior knowledge as starting point for teaching. It showed teachers' general lack of theoretical understanding of prior knowledge and its impact to teaching for understanding. Newton (2012) suggested that teachers not only see understanding as a mental product but even adopt a teaching orientation which allows any reasonable strategy to support that understanding for children to develop "the ability to think and use knowledge flexibly" (p. 14). This study proposed to adopt drawings as a reasonable strategy to orientate Singapore teachers to teach to satisfy children's interests, facilitate and enable flexible learning and creativity to enhance children's retention of knowledge (Newton, 2012). Therefore, this study has implication on teachers' trainings. To teach teachers how to read drawings by identifying children's thoughts, ideas and information contained in their prior knowledge framed by Vygotsky's zone of proximal development (ZPD) theory. We shall return to discuss these issues in component II by looking at examples of children's drawings for evidence of prior and spontaneous knowledge. Moving on to the second influential factor that affect teachers' teaching decisions was:

4.5.3 Factor two: The school curriculum and teachers' obligations.

In Singapore, some preschools operate with prescribed curriculum designed by curriculum "specialists." It prescribed the taught content-knowledge (e.g. thematic approach with specific themes and activities spelled out for the whole year) and pre-determined daily lesson activities and objectives. It is packaged with the necessary resources as convenient "take away" for teachers to teach under the convention of "quality control" or "standardized curriculum" to ensure an acceptable level of teaching actually takes place in the classroom. Perhaps, due to the fact that the school curriculum serves many purposes: to hold teachers accountable to parents and students for what was taught in school, to ensure a minimum standard of learning in the society as well as keeping the school system well-lubricated and working for marketing purposes. Table 4.2 summarizes the teachers' comments on curriculum and their obligations.

Table 4.2 Factor two: The school curriculum and teachers' obligation

Inductively Developed Code Categories

Category	Code Category	Key terms	Characteristic Code 2 responses
Q2. Why the chosen percentage? **Code two: The school curriculum and teachers' obligation**			
C1	**School curriculum**	*"Standard;"* *"Pre-determined;"* *"Fixed;"* *"Syllabus;"* *"Rigid;"* *"Regulation;"* *"Schedule;"*	*"In the school system, the curriculum has pre-determined standard themes;"* *"Is compulsory to <u>follow</u> <u>religiously</u>."*
	Teacher's obligation	*"No choice;"* *"Compulsory;"* *"Pressurised;"* *"Fulfil;"* *"Deliver;"* *"Have to complete;"* *"Follow,"* *"Answerable;"* *"To achieve."*	*"To teach the children what is <u>compulsory</u>;"* *"It's not the teacher's choice to decide but to rush to complete it."* *"If this topic is in the curriculum I feel obliged to teach it. I have to follow the directions and theme as provided from the <u>management level</u>."*

In Singapore, the curriculum obliges teachers to teach as prescribed and is operationalized as themes and topics conceived as new lessons and concepts to learn. The teachers perceived the curriculum as predetermined – a standard course set within specified time frame by the school curriculum developer(s) and committees. The sentiments were teachers have to achieve it in line with the requirements and "*rush to complete it*." In other words, to teach was to *follow* a prescribed curriculum, a predetermined set of content-knowledge. To return to the question: "Whose knowledge was given priority in teaching? Obviously, the

priority was the school's curriculum content-knowledge. Research on how children learn clearly encouraged building on the child's prior knowledge (Vygotsky, 1978) because studies had shown the triadic-relationship of knowledge-meaning-retention in learning. Whitebread (2012) suggested learning is a process of establishing patterns, pattern matching and making links between patterns of existing and new knowledge. I shall return to discuss prior knowledge in component II. However, the impact of a prescribed curriculum on teacher's teaching cannot be ignored. If, curriculum was a factor in determining when teaching begins than what aspects of learning were taking place? Singapore teachers seemed resigned to being directed by a curriculum in order to get on with the job of teaching. Factor one dealt with teachers' philosophical idealism of what learning and teaching meant and the importance of equal opportunity to learning for all. But, in factor two, we witnessed the vulnerability of teachers driven by curricular demand and obligations. So, how could we mediate between a learner's prior knowledge and a prescribed curriculum? Two respondents summed up the feelings of many others:

> *"In order to follow the curriculum there's no choice but to teach whatever is already asked of by the curriculum, time constraint is a factor too;"*

and

> "*Being in a position to carry out the given curriculum puts me in a place where I do not have many option to consider about the prior knowledge of the children."*

The dilemma of fulfilling a prescribed curriculum left teachers with "no time" or "no choice" to consider a child's prior knowledge. Was it the teachers' alleged claim of "no time" and "obligation" to deliver a prescribed curriculum or a general lack of a strategy, knowledge and skill in assessing children's prior knowledge for effective teaching? This study aimed to address the above issues employing drawings as a strategy to assess children's prior knowledge. Teaching/classroom management and coping strategy was the third factor teachers deliberated in deciding when to teach new material (see Table 4.3).

4.5.4 Factor three: Teaching-management/ coping strategy.

The teachers' teaching decisions considered practical classroom management issues such as *"manageable"* and the *"number"* of children that required extra teacher's attention to catch up with lessons. The findings showed coping strategies teachers had devised to manage the less-competent ones such as "*split;" "group together;"*and *"one-on-one"* teaching strategies to meet the diverse learning needs in a classroom situation. Since these teachers were concerned about classroom management then drawing as an activity may appeal to them because it could be pursuit individually, in small groups or whole class activity requiring little teacher teaching.

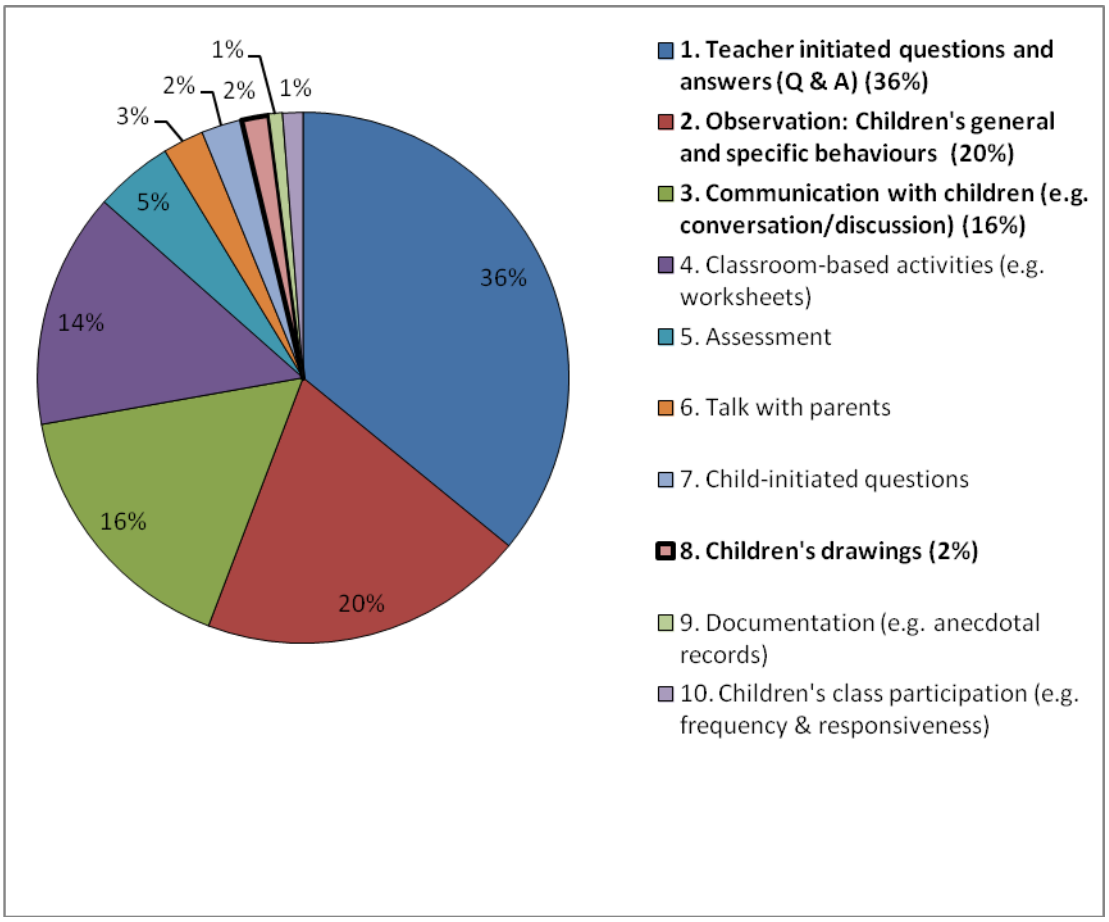
Table 4.3 Factor three: Teachers' teaching-management/coping strategy to manage students of differing learning abilities

Inductively Developed Code Categories			
Category	**Code Category**	**Key terms**	**Characteristic Code 3 responses**
Q2. Why the chosen percentage? **Code three: Teaching-management/coping strategy**			
TM1		*"Manageable;"* *"One-to-one."*	*"Is manageable for teacher to teach one-to-one"*
TCS2		*"Strategy;"* *"Different activities;"* *"Split."*	*"One strategy is to split the group who needs help and to use play-time to teach the children."*

4.5.5 Teachers' preferred strategies used to find out about children's knowledge.

This section discusses findings on survey question, "How do teachers find out about children's insufficient knowledge?" It aimed to understand what common strategies teachers used in real classroom practices and to determine whether drawing as a strategy was one of the teachers' choices (see Figure 4.6).

Figure 4.6 Teachers' top ten preferred strategies used to find out about children's knowledge



The discussion explores the first three most preferred strategies and the eighth strategy, children's drawings relevant to this study. Table 4.4 describes inductively developed code categories of these informal assessment strategies Singapore teachers employed in everyday classroom situations.

Table 4.4 Teachers' top three preferred strategies used to find out about children's knowledge

Inductively Developed Code Categories

Category	Code category	Key terms	Characteristic code responses
Q4. How do you find out about children's insufficient knowledge?			
TQA1	**Teacher initiated Q & A**	*"Age-appropriate questions;"* *"Open-ended questions;"* *"Ask questions prior to teaching the topic;"* *"Testing and asking questions;"* *"Child unable to answer;"* *"Give vague answers."*	*"Asking questions during tuning in, pertaining to the lessons/theme;"* *"They do not know how to answer when we ask them question on the topic, or answer your question completely out of context."*
OB2	**Observation of general and specific behaviours**	*"Daily observations;"* *"Gauge responses, seem 'lost' or need help;"* *"Through their look, behaviour;"* *"Informal and formal observations;"* *"Gestures/body language*"	*"Watching them at play and observing the ways they try to solve problems;"* *"Has puzzled expression on his/her face."*
CC3	**Communication with children**	*"Daily communication;"* *"Conversations;"* *"Interactive sessions;"* *"Circle time;"* *"Talk;"* *"Private discussions;"* *"Class discussions;"* *"Basic simple conversation;"* *"Children's conversation"* *"Informal talk;"* *"Chatting meal times or story times"*	*"We talked about it and share;"* *"During lesson or follow up, interact with the children."*

Why, do Singapore teachers prefer these top three strategies? What did they have in common? Respondents suggested teacher-initiated "question and answer" (Q & A) and "observations of children's behaviors," for nuances of puzzled or blanked looks helped them to pick up children displaying learning difficulties. While "communication with children" referred to incidental conversations over activities (e.g. circle time and chatting with individual child) (see Table 4.4).

On the contrary, children's drawing as a strategy was ranked eighth out of tenth. The respondents' views were (see Table 4.5):

Table 4.5 Drawing as a strategy to find out about children's knowledge

Inductively Developed Code Categories

Category	Code Category	Key terms	Characteristic Code 8 responses
Q4. How do you find out about children's insufficient knowledge? **Code 8: Children's drawings**			
CD8	**Children's drawings**	*"Wrong representations;"* *"Drawing comments made"*	*"By giving them a selective theme and analyse the meaning of what they are implying on the drawings."* *"A sharing session where students talk about their final drawing would give a good gauge of the students' knowledge or lack thereof"* *"Observing from their response such as drawing, comments."*

Children's drawing as a strategy was recommended by a marginal 2% (8) teachers. They discussed drawings as evidence-based assessment by looking at the presence or absence of implied information related to the theme. The teachers emphasized the importance of interactions or sharing sessions with the child to understand their drawings to inform analysis. One teacher argued that there is limitation to drawing with a possibility that the *"child's choice [chose] to omit drawing it and not out of little knowledge."*([ ] added). This argument was taken up in subsequent chapters with reference to Freeman's (1980) take on such issues (see Chapter 8 p. 258). This aspect together with other variables affecting drawings are discussed in component II and III.

4.6 Sixty-one Children's (5 – 6 years) Views on Factors that Affect Their Learning

The investigator conducted face-to-face small group interviews with 25 girls and 36 boys and a mini-survey with five preschool teachers to find out their ideas about learning and teaching and how they experienced it in a real classroom situation (see Appendices D12 & D13). It aimed to triangulate between teachers' perspectives in particular, the impact of prior knowledge; theoretical perspectives, and children's perspectives to get a sense of the role of prior knowledge impacting educational experiences.

Table 4.6 Children's and teachers' perspectives on factors that affect learning.

Children's perspectives			
Prior Knowledge	**Children Factor**	**Teacher Factor**	**Peer Factor**
"Every time at home I read books." *"I understand always becos' I read."* *"Read books every day."* *"Father, mother didn't teach you before."* *"Becos' we never learn that new word before."* *"Father/mother never teach you anything."* *"Some words I don't know becos' my mother /teacher haven't teach some words."*	*"Becos' we pay attention."* *"Listen to teacher"* *"We don't listen. We sometimes dig nose."* *"Sometimes we don't know how to talk, is shy."* *"Sometimes we forget."*	*"Becos' a lot of interesting thing that teacher teach e.g. food pyramid."* *"Becos' teacher talk about hard things; so we don't know."* *"Becos teacher never teach us becos' we never learn."* *"The language that the teacher speaks."* *"Becos' teacher speak English."* *"We all also speak English."*	*"Everybody keeps quiet."* *"Fight with friends."* *"Becos so many people want to talk to me."* *"Playing with children"* *"Becos' sometimes all my friends keep talking to me then later I forget already – noisy."*
Teachers' perspectives			
Prior Knowledge	**Children Factor**	**Teacher Factor**	**Environment Factor**
"Children already know what to do." *"Not interested, already had learned or grasped the material taught."*	*"Slow learner."* *"Get distracted easily."* *"Lack concentration, not attentive, playing."* *"Language barrier."* *"Children not interested in the topic during the lesson."*	*"Information was not clearly delivered."* *"Lesson was long and boring."* *"Lack of activity."* *"The lesson is hard/easy to understand."* *"The lesson's content or the level pitched was it appropriate?"*	*"Noise from other classes."* *"Class size too big."*

Basically, the aim was to get directly from children their perspectives of factors that affect their learning. The findings presented four major elements:

1. Prior knowledge element

- I.e. Knowledge gained from parents' teaching or reading (e.g. *"Father, mother didn't teach you before" and "becos' we learn it at home; mother and father teach me")* or from self-readings, *"I understand always becos' I reed (read)."*

2. Children element

- I.e. The children perceived themselves, a factor based on an understanding that paying attention and listening in class contribute to one's learning (e.g *"Becos' we pay attention;""listen to teacher;"* or *"becos' I don't know-becos' I blur, blur;""when we are naughty, don't pay attention").*

3. Teacher element

- I.e. Pedagogical practices – interesting delivery, choice of language spoken, and the level of task difficulty affect children's learning. The comments were *"becos' teacher talk about hard things; so we don't know;" "The language that the teacher speaks."* "*becos' a lot of interesting thing that teacher teach e.g. food pyramid"*

4. Peers element

- I.e. Peers' behaviours that helped or distracted them from learning. The comments were *"Becos so many people want to talk to me;" or "Everybody keeps quiet"(so I learn).*

Similarly, from the teachers' perspective the last factor was "learning environment" (e.g. class size -*"Class size too big"* or noise generated -*"Noise from other classes"*) instead of "peer" factor. It was interesting to note that the children showed tacit awareness of the role of prior knowledge with reference to "*reading books"* and "*father's or mother's teaching*" as factors that affect their learning. Irrefutably,

children and teachers recognised prior knowledge played a pivotal role in children's learning and teachers' teaching.

4.7 Discussion

The primary hypothesis was information in children's drawings could be used to inform teachers' practices. Component I findings suggest a plausibility of employing drawings as a strategy to help teachers to recognise and identify information of prior knowledge in order to address the teachers' general confusion over the pro and con of prior knowledge. Perhaps, Singapore teachers need to be taught specific evidence-based strategies (e.g. reading children's drawings for information/ideas) to effect Newton's (2012) idea of teaching for understanding by connecting to children's prior knowledge. Component III discussed how teachers were taught to use the Bloom's TEO to evaluate drawings for information content-knowledge and cognitive processes pertinent to best teaching practices. Equipping teachers with skills and knowledge to read drawings for curricular ideas most probably help teachers' to balance their obligation to the "school curriculum" and "classroom management" issues because drawing as an activity required little or no supervision from the teachers. Next, the teachers' pedagogical beliefs that children's prior knowledge makes learning easier and an advantageous lead-in for more meaningful learning was equally balanced by another group of teachers who felt that "*if they [children] knew the topic they may feel bored*." This confusion is a concern because many researchers had emphasized "our ability to remember new information about a subject depends considerably on what we already know about it" (Carver & Klahr, 2001; Chaffin & Imreh, 2002; Keil, 1999; Lesgold & Nahemow, 2001 cited in Santrock 2004: 266). How to help Singapore teachers to identify and recognize children's prior knowledge? At this point it is important to situate the discourse of this study, broadly under a domain "Education evaluation" for the purpose of informing decisions about individuals and curricula in an education system[1] (George, 2004, p.240 footnote 1; see Figure 4.7).

[1] Diagram is adapted from George 2004, p. 240 Figure 10.1 Purposes and roles of evaluation*; **Italicized information added by the investigator.***

Figure 4.7 Education evaluation and children's drawings as instructional feedback

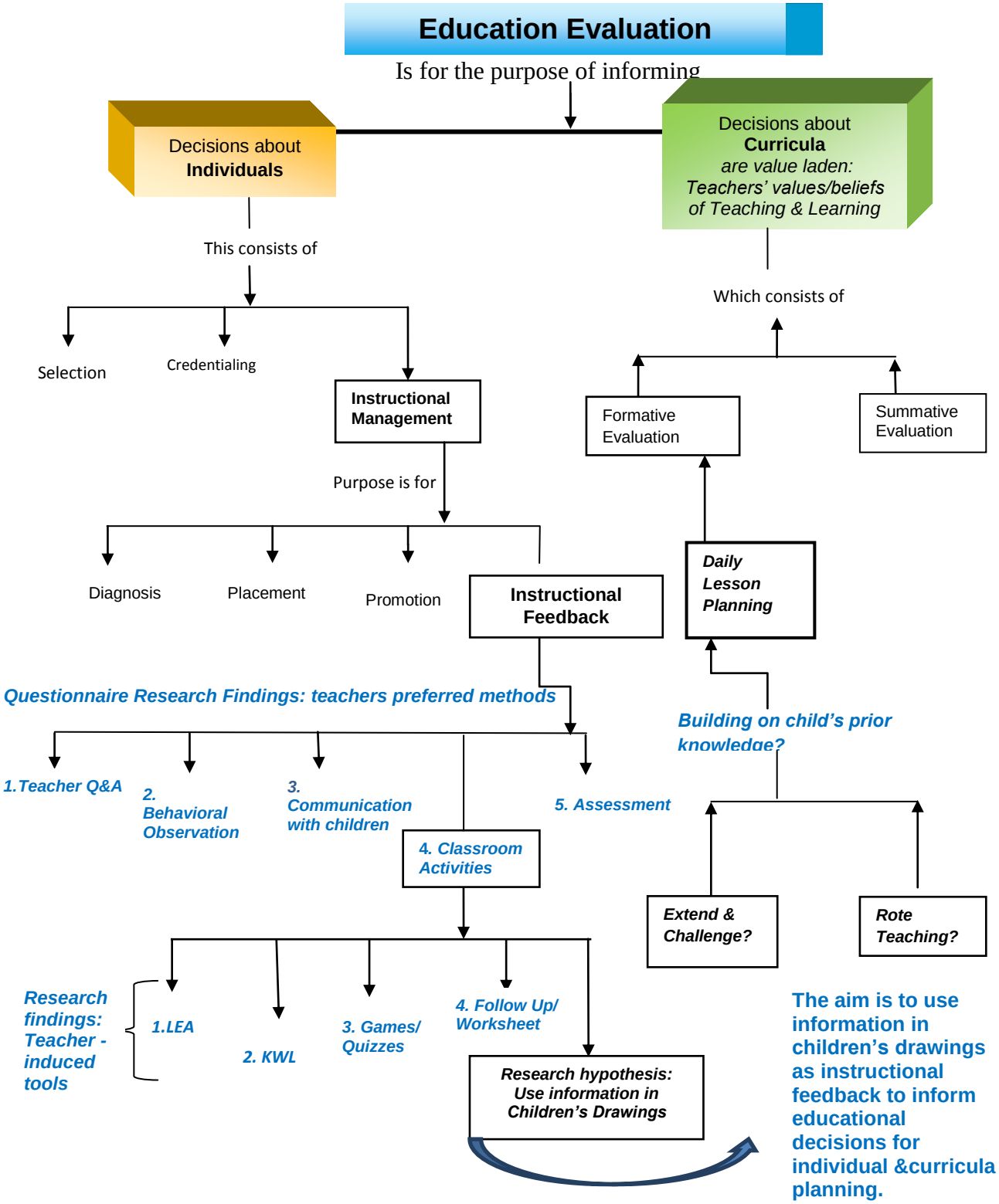


Figure 4.7 explains and situates this study of children's drawings as one of the classroom-based activities that provides instructional feedback to teachers and school head to make curricula decisions for the individual and curricula. The idea is to get teachers to consider using information gleaned from children's drawings to extend children's prior knowledge, to enrich daily lesson planning and to manage the school curriculum (see Chapters 5 & 6). In short, this study proposes employing children's drawings for education evaluation. George, (2004) suggested that teachers played a very significant role in determining the success and the direction of a curriculum change (p.198).

> *In particular, the teachers' beliefs about matters such as the formality of their role with children, how children learn, classroom management, the nature of knowledge, the reasons of learning their subject matter, and their role in curriculum decision making determine the degree to which a new curriculum "fits" in a particular teacher's classroom.* (George 2004:198)

He suggested that teachers shape a new curriculum to their beliefs - teachers *adapt* rather than adopt curricula. Any curriculum that teachers could not readily adapt, they regard as "impractical" (Doyle & Ponder, 1977-1978 cited in George, 2004, p.198). The research aims to help teachers to adapt by integrating information deduced from children's drawings into daily curricula planning. Therefore, component I findings offered new insights to the investigator that to enhance the practical value of this research, teachers' beliefs and concerns must first be identified and recognized in order to bring about a plausible change in teachers' approach to education evaluation. Drawing as an education evaluative tool; the teacher; and curriculum change are intimately woven. Curriculum change begins with teachers. George (2004) postulated the only way to empower students' learning is through teacher empowerment. Thus, teachers' beliefs and values must be acknowledged to influence educational reform. Moreover, a number of studies demonstrated clear consistency between teachers' beliefs and practices (Caruso, Dunn,&File, 1992; Charlesworth, Hart,&Burts, 1991; Charlesworth et al., 1993; Oakes & Caruso, 1990; Stipek & Byler, 1997 in Bracken and Fischel, 2006). George (2004) also argued that "like children learning language, teachers based their practice on prior beliefs and knowledge" (p. 231). Thus, the findings of teachers vague understanding about the role of prior knowledge in a child's

learning made the further stages of the study necessary. For the reason that curricular content had impact on the cognitive development of pre-schoolers and their preparation for elementary school (ACYF, 2003; see also Fischel et. al., 2005). Furthermore, component I showed Singapore teachers needed to be taught how to teach for understanding. This study aimed to show to the teachers, visual evidence of children's prior and spontaneous knowledge expressed through drawings. Teach them how to use this information to enrich lesson planning to extend children's learning and thinking as part of an on-going process of education evaluation.

The following discusses strategies teachers employed to find out about children's insufficient knowledge. These were conceptually categorised into two main categories in terms of responsiveness or openness to a two-way participation between the assessor (teachers) and the assessed (children; see Table 4.7).

1. Teacher-induced tools referred to methods of investigation that are determined and carried out in a highly teacher-controlled manner for interpretations and evidence gathering. A teacher's ability to generate satisfactory interpretations is highly dependent on the quality of teacher's knowledge and understanding of child psychology and development, to make sense of their observations (e.g. children's behaviours and participation in class).

2. Child-responsive tools are mostly informal assessment methods carried out in authentic situations. The investigation is progressive, recognizing children as knowledgeable partners who could contribute to meaningful interpretations.

Table 4.7 Two conceptual categories and teachers' informal assessment strategies

Two conceptual categories and teachers informal assessment strategies	
Teacher-induced tools	**Child-responsive tools**
1. Teacher Initiated Questions & Answers	1. Communication with Children (includes interaction, discussion, conversation)
2. Observation: General & Specific Behaviours	2. Child Initiated Question & Answer
3. Through Classroom Activities (includes LEA, Games, Follow-up)	3. Drawings
4. Assessment	
5. Documentation & Informed by Developmental Milestone/Norm Referencing	
6. Talk with Parents	
7. Child's Participation	

Table 4.7 showed Singapore teachers preferred a highly-teacher-controlled mode of evaluating children's knowledge. The first three strategies had shared characteristics:

- Quick and easy to implement; no need for added resources except for teacher's verbal and visual-perceptive skills to ask questions and to discern children's behaviour and expressions.

- Teacher had absolute control over when to start and end the communication or observation process.

- Highly subjective and dependent on the teacher's child developmental knowledge; thus, subject to observer bias to make sense of what they hear and observe.

These ad-hoc strategies were tried and tested, proven to be effective in eliciting information from children under the constraint of time and resources (all strategies have their strengths and limitations). Two strategies will be discussed briefly to understand it from the teachers' perspectives. It is not the research intention to compare by claiming that children's drawings as a strategy is better than the teachers' preferred strategies.

Teacher initiated Q&A. It refers to teachers asking direct and/or leading closed questions usually converging to a right or wrong answer. In the words of one respondent, it was to "*ask or test them verbally to see if they are able to understand what was being taught.*" What do teachers look out in Q & A to assess whether children have sufficient or insufficient knowledge? The teachers seemed to intuitively pick up cues such as "*vague answers;" "amount of response;" "compare with the norm answers appropriate to the age group;" "no response;" "not able to answer;" "answer your question completely out of context;"* as guides to assessment. What questions were usually posed to the children? Questions teachers claimed to be *"thoughtful, meaningful questions;" "open-ended questions;" "topic related questions;" "closed-ended questions;" "age appropriate questions;" "critical questions;"* and *"simple questions"* were suggested. What could be the teacher's role in Q & A? The respondents mentioned *"listen to what they will tell me;" "give ample time for them to*

think;" "every pre-schooler ample opportunity to express themselves;" "scaffold their thoughts;" "gauge their knowledge from their responses." Why Q&A? Perhaps, as suggested, it is a quick way to the "*activation of schema, relating the topic to them and get them to respond then assess the response and see if they possess prior knowledge about the topic/theme/concept."* According to the respondents, Q&A is implemented during *"tuning in;" "as an introduction of a specific topic;" "during class discussion;" "before starting a new topic;" "before actual lesson starts;" and "at the onset of the lesson."* Of course, there are debates over the definitions and specificity of the terms used by the respondents. However, it is not the research intention to dwell in detail on each suggested strategies but rather to get an indication of the types of strategies used.

Drummond (2003) argued that Q & A is not an effective means of assessing children's prior knowledge because it is highly predictable and routine, and children may play the game of giving teacher text-book answers to gain teacher's approval and not what they truly think.

> *We have no chance of learning about children's learning if our questions focus on their performance in a highly predictable question and answer routine. We must not underestimate children's ability to divine the required answer without any mental activity corresponding to the learning we believe we are assessing. Equally, we must not pretend to ourselves that all children are prepared to play the question and answer game according to the teacher's rule* (Drummond, 2003, p.89).

Moreover, in a Q&A session not all children were interested in playing the Q & A game because they were well aware that teacher already had the one correct answer in mind and thus, not interested in participating in the Q&A session. Children who lack verbal skills or have difficulty framing thoughts in words in the split seconds to give an intelligent answer may be marginalized. Some children commented (see Appendix D12 & D13):

> *"Becos is hard to explain. Sometimes very, very, very, very hard to explain."*
>
> *"Sometimes we don't know how to talk, is shy."*
>
> *"Sometimes we don't know how to speak the word. Don't know how to answer the question."*

The children summed up Coltman and Whitebread's (2003) concern that emerging unfamiliar concepts that children are developing are beyond their confident linguistic grasp to fully articulate it because to formulate a question required a "degree of familiarity with possibilities gained by experiences that are as yet beyond young learners" (p. 276). Perhaps Q&A as tune-in activity adds little to children's learning besides being part of a lesson's ritualized procedure. As a result, the teacher missed opportunity to learn about the children's learning (Drummond, 2003). Q&A is useful as a teaching strategy only when certain conditions were put in place – the teacher needs to demonstrate active listening skills to attend to a child's underlying meaning beyond the spoken words; teacher's open-mindedness to explore "*out-of-context*" answers; good questioning skills and not leading questions directed to one right answer. Teachers' competency in questioning techniques does make a difference in children's learning and understanding (Newton's 1996, PhD thesis "Teachers' questioning in primary school science" into teachers questioning technique). More importantly do the questions cue and connect with children's prior knowledge? Questioning strategies should request explanation, elaboration, clarification and extension of children's contribution for it to be meaningful.

How much time in reality could a teacher afford to hear from every individual? Perkins (2012) criticized that most of the time classroom Q & A are meaningless and bizarre game of "guess what's in teacher's mind" channeling children's response towards a require answer with little cognitive challenge (p.40). As a result, in early years classroom usually the teacher dominated the discussion. King (1994) suggested providing students with help oriented toward making connections with material and conceptual support rather than answers as a useful form of scaffolding. Giving the right answer did not equate to having understood the concept (e.g. when a teacher asked what is four plus two equal to? A child may blurt out the answer "six!" But he/she may have great difficulty in explaining the concept). I believe the same principle applied to children's drawings. A child who did not represent ideas in drawing does not necessarily have no knowledge about their existence because the meaning attached in drawing is subjected to "change with time and shifts in thinking" (Hall, 2010, p. 97) yet good enough to give teachers a snap-shot of the general pattern of thoughts and knowledge of a class of children as lesson starting point.

Communication with children (includes interaction, discussion, and conversation). The teachers' comments were "*conversation with the children;"*

"children's conversations with friends;" "discussions with individual or group of children;" "interact with the children;" "sharing session" in which children could *"talk freely"* (Survey respondents, 2011). The respondents defined "communication with children" as "*casual conversation;" "informal talk;"* and "*chatting"* time. In the process teachers assessed for "*content," "concept*" and "*words."* Teachers suggested these activities usually happen during "*circle time" or "during meal times" or "story times*" or "*accidentally."* Fine & Glassner (1979) and Pryor, (1995) noted children are sensitive to people who pretended to be what they are not in conversation. A two-way communication is better than one-sided Q&A strategy since children, generally, liked the attention of a one-to-one conversation with a familiar adult. However, there are children who refused to be probed or engaged in a conversation too. Yet, undeniably, it is one of the quickest ways to find out information about the child or the knowledge concerned.

Teachers supplemented these strategies with "classroom activities" (the fourth preferred strategy suggested in Component I survey findings). It is relevant to the discussion here because it helps to situate the role of children's drawings played in today's classroom (see Table 4.8)

Table 4.8 Conceptual categories and teachers' preferred classroom-based activities

Closed-ended Written Activity	Open-ended Activity	Closed-ended Verbal Activity
1. Demonstration	1. Games	Verbal quiz
2. LEA (Language Experience Approach)	2. Drawing	
3. K-W-L (what you Know; what you Want to know; what we have Learnt)	3. Story books	
4. Follow-up activities	4. Field trips	
5. Worksheet	5. Projects	
6. Mind map about the topic	6. Hands-on activities	
7. Activity sheet	7. Experiments	
8. Simple questionnaire		
9. Mini quiz		
10. Class test		
11. Work book		
12. Diagnostic test		
13. Tests		
14. Written assignment		
15. Simple concept test		
16. Picture talk		

These suggested activities were categorized into three conceptual categories:

1. **"Proven established-methods"** are Language Experience Approach (LEA) and (K-W-L) what a child Knows, what he/she Wants to know, and what he/she had Learned. In Singapore these methods are taught in teachers' trainings to help teachers connect with children's experiences. K-W-L is a teaching approach created by Ogle (1986) delved into a child's prior knowledge of what a child Knows, what he/she Wants to know, and what he/she had Learned. It helps teachers to activate and structure children's prior knowledge and then summing up and reflecting on what was learned and children's desire to know in written form. According to Reichel, (1994) KWL is a useful strategy for built-in assessment and planning because in the process the child's ideas, questions, and input are recorded on a chart for the whole class or for individual students. While LEA is a literacy-based approach of reading instruction drawn from the personal experiences of the child. It is captured and recorded by the teacher then read to the class to help the child to connect spoken with the written forms.

2. **Common classroom-based activities** were mostly teacher designed written tasks where achievement grades and scores were assigned with a check mark or given a star for good work (e.g. worksheets, quiz, workbook, activity sheet, class test) useful for reporting to parents.

3. **Creative-based activities** are tasks that provide for children's input such as interpretations, perspectives, and creativity (e.g. games, drawing, field trips, hands-on activities, projects). These activities empowered children as active co-partners in assessment.

The research aimed to propose an alternate strategy aligned with creative-based activities that are child-responsive and evidence-based; children's drawings. Children's drawings as an alternate informal, formative assessment tool met the The National Association for the Education of Young Children and National Association of Early Childhood Specialist in State Departments of Education (NAEYC, NAEC/SDE, 2003) stipulation that appropriate, valid, and reliable assessment must not only be

ethical, appropriate, culturally and linguistically responsive, but must tie to children's daily activities (Mindes, 2007). Drawing as an activity is informal, spontaneous, and culturally sensitive because it is child-generated. It was seen as one of the classroom-based activities by at least 2% teacher-respondents because drawing could provide instructional feedback useful for teaching purposes and planning. Drawing offers teachers with instructional feedback that young children may not be linguistically equipped with the verbal skills to describe complex ideas but teachers could be visually informed by their drawings.

Teachers' suggested classroom-based activities were planned with the intention of helping children to learn but Athey's (1990) study of young children's cognition schema, argued "not enough attention was paid to how children learn most effectively, and consequently, how teachers can teach most effectively" (Athey 1990, p. 8 cited in Drummond, 2003, p.121). In order for children to learn and teacher to teach most effectively, teachers need to be taught to understand how children think and learn through drawing. This leads us to Component III, the Bloom's TEO as the framework to uncover and made explicit the "fundamentally covert, typically tacit, mental processes" (George, 2004, p. 118) induced by drawing. With drawing, there was a lesser chance of teachers' micro-leading and intervening compared to Q&A. Therefore, drawings may capture children's spontaneous perceptions and misperceptions more readily because the nature of children's drawings is "intentional and communicative" (Freeman, 2008, p. 37) bringing forth the knowledge and experience they have (Hein & Price, 1994).

4.8 Conclusion

Component I has established some findings that could generalize to the teacher population's views about teaching and learning. Marton's (1981) notion of the "collective mind" (p. 196) helped us to draw some conclusions based on the collective intellect of 325 teacher-respondents "seen as a structured pool of ideas, conceptions, and beliefs underlying the possible interpretations (or possible constructions) of reality" (p. 198) of what teaching and learning meant to them and children. Reith (1976) and Blackmore (1977) concurred that the "sharing of learned ideas" (p.116 in Marton, 1981,

p.197) added new dimension to the progress of information, interpretations and descriptions of teaching and learning. The findings have mainly illuminated conflicts teachers faced in meeting curricular demands at the expense of teaching to connect with children's prior knowledge to effect concept change. A teacher's values and beliefs have impact on pre-schoolers' cognitive development. The findings showed the teachers more or less knew the importance of children's prior knowledge as indicated by the different strategies stated to find out about their knowledge. However, it clearly showed that the teachers were rather confused over the role of prior knowledge as to whether it distracts or excites children's learning. In other words, teachers not only needed help to consider an alternative child-responsive assessment tool but also to understand conceptually the meanings and significance of preschoolers' pre-existing knowledge. The study will, therefore, address the above real world issues by investigating whether children's drawings could function as an instructional feedback tool offering evidence of children's learning and to guide teachers to realize prior knowledge as a means to an end in bridging between the threat of assumed boredom and challenge (learning and teaching perspectives respectively) while at the same time to encourage new knowledge acquisition. The next chapter will introduce Component II and discusses the qualitative results of children's drawings as sources of evidence of learning by comparing pre-and post-lesson drawings.

Chapter 5 Research Component II Children's Thematic Drawings: Wild Animals - Findings and Discussion

Component II describes qualitative findings of 25 children's drawings (5- 6 years) collated from two preschools in Singapore. The drawing themes were predetermined by the respective preschool's curriculum. This chapter reports on the wild animals drawings by 14 six years old children from a childcare centre (see Appendices E1 – E28). The water cycle drawings by 11 five years old children from a kindergarten are reported in Chapter 6. The aim is to determine evidence of learning with a coding checklist mapped to the respective teacher's lesson objectives. This involves comparing pre- and post-lesson drawings to illuminate information that could be used to inform teachers' practices to plan lessons that extend children's learning.

5.1 Research Component II Issues

There are two issues to address:

1. Is there evidence of information encoded in the children's drawings?
2. What information is encoded (if any)?

5.2 Research Component II Aim

It aimed to examine evidence of information encoded in wild animals drawings with respect to children's prior knowledge, and spontaneous knowledge (inclusive of prior knowledge, subject matter knowledge, and knowledge far more than subject-related matter).

5.3 Methodology

The methods used were interviews and participant observations in natural settings where children sat in groups of seven. The investigator made three visits on 10, 11 and 12 November 2010 as scheduled by the principal. The duration of each visit was about 2 hours 15 minutes (40 minutes for each pre- and post-lesson drawings and 45 minutes of teacher's teaching). The teacher submitted three lesson plans related to the wild animals theme. The rationale of a 3-day visit was to observe and video record lessons development and children's responses to the drawing tasks. The investigator interviewed and recorded the children's descriptions of their drawings when each child handed them over to the investigator. The same instruction "*draw what you know about wild animals; name and spell them*" was given for pre- and post-lesson drawings in line with the teacher's lesson's objectives and teaching intention. The class teacher then conducted the planned lesson when all the children had completed the first drawing (see Appendix E for teacher's lesson plan).

5.4 Sampling Procedures

This was a self-selected opportunistic participants sample because the principal deemed the research study may benefit the teacher's professional growth and children of lower-income families. It adopts a thematic curriculum approach (see Appendix A). The principal planned the year's curriculum of five themes (e.g. "My world and me;" "Occupation;" "Transportation;" "Weather;" "Animals"). But the teachers have the flexibility to plan and deliver the lessons most appropriate to their age groups. The investigator wrote to the preschool's principal detailing study aims and procedures together with a package containing consent forms for the participating school, teacher and parents for participation. Confidentiality was ensured, to protect preschool and children's participation, with a clear understanding that no questions would be asked for any dropouts.

5.5 Participants' Characteristics

Fourteen children (6 girls and 8 boys), average age was 6 years 5 months at the point of data collation. The ethnicities were 13 Chinese and 1 Indian Singaporean. The class participating teacher was Malay with 11 years of teaching experiences with a Diploma in leadership studies in Early childhood education. The childcare centre operates from 7 a.m. to 7 p.m. located north, Singapore with a total capacity of 72 children ranging from 2 to 6 years old. Teacher-child ratio was 1:18. The families were 44% low income and 56% Mandarin-speaking. The research drawing theme was the childcare centre's thematic lesson on "Wild animals" (see Appendix E).

5.6 Measures

For wild animals theme, 14 pre-and post-lesson drawings were evaluated with a coding checklist mapped to the teacher's lesson objectives as criteria to record and examine features in the drawings (Schussler and Winslow, 2007; S.P.A.C.E project 1990). The criteria were divided into factual and conceptual knowledge. Teacher's lesson objective was "*name and spell 11 wild animals*," clearly directed at factual knowledge. When probed further by the investigator the teacher contemplated for a while and verbally told the investigator that she would like to see whether the children could name and spell the list of "*lion; tiger; elephant; fox; wolf; rhinoceros; monkey; zebra; deer; giraffe; and cheetah.*" Krathwohl et al, (2001) defined factual knowledge as knowledge of discrete, isolated content elements – "bits of information" of "terminology and knowledge of specific details and elements" (pp. 27 & 45). In order to evaluate drawings for information it was necessary to map not only to the lesson objectives but lesson procedures too because teachers used it as a means to achieve lesson's outcomes. McDermott (1984), suggested "…it is important in interpreting findings to bear in mind the *procedures* used" (cited in Hein and Price, 1994, p. 11). The teacher's lesson procedures involved reading and showing pictures of wild animals from "*My first book of wild animals*" by Lorraine Jean Hopping. The procedures involved identifying, classifying and categorising

examples of animals' habitats, sounds and animals' distinctive features, targeting at the acquisition of conceptual knowledge in addition to factual knowledge of animals' names. Anderson & Krathwohl, 2001 defined conceptual knowledge as "more complex, organized knowledge forms" (p. 48). It includes knowledge of "classifications and categories, principles and generalizations, theories, models, and structures" (p27). Hein and Price (1994) cautioned that "we cannot separate children's larger common knowledge from the lesson objectives" otherwise it "covered up what might be interesting about a child's knowledge" thus losing a meaningful picture of what a child knows and understands (pp. ix & xii). This explained why the children's conceptual knowledge must be evaluated, although not explicitly articulated in the lesson objectives.

To draw conclusions for checklist coding, evidence of recurring themes or patterns of children's schematic interests (Athey, 1990) together with Matthews's (1999, 2003) conceptual framework of children's construction of meanings shared by many other writers such as Freeman (1979), Sommers (2009), Golomb (2004), Jolley (2010) were applied to examine the general pattern of learning featured in the drawings. The guiding principle of drawings evaluation is not so much on what the children have not represented or capable of representing but "did-not-show-it" arguments. Instead it was based on what the children *know* and *can* represent at the point of pre-and post-lesson drawings data collation suffice as evidence of knowledge for investigation (see Chapter 4 p.117 & Chapter 8 p. 258). Table 5.1 shows a coding checklist for eliciting information of children's learning to triangulate with the Bloom's TEO to attest evidence of information found in the drawings (see Appendix E 29; & Chapter 7).

Table 5.1 Wild animals' information coding checklist

Factual knowledge **Lesson's objectives:** **"To name and spell a list of wild animals"**	**Pre-lesson Drawing1**	**Post-lesson Drawing 2**
1. Lion 2. Tiger 3. Elephant 4. Fox 5. Wolf 6. Rhino for rhinoceros 7. Monkey 8. Zebra 9. Deer 10. Giraffe 11. Cheetah Others:		
Conceptual knowledge of wild animals inferred from the lesson's procedures **Did the child draw by inferring the following:**		
1. Wild animals need food for survival; 2. Wild animals attack others; 3. Sounds of wild animals; 4. Feelings of wild animals' e.g. happy, angry; 5. Wild animals live in the open field; 6. Wild animals caged in the zoo; 7. Wild animals' movements e.g. walk, monkey swings, snake slithers; Others:		

5.7 Findings

This section describes qualitative findings of 14 pre- and 14 post-lesson wild animals drawings coded with the checklist.

5.7.1 Children's factual knowledge of the wild animals 11 word-list.

The lesson outcome required children to "*name and spell 11 wild animals*." Table 5.2 shows the number of children who could name and spell some wild animals in pre-lesson (D1) and post-lesson (D2) drawings.

Table 5.2 Number of wild animals named and spelt in pre-and post-lesson drawings

Name and spell 11 wild animals	Pre-lesson D1		Post-lesson D2	
	% / No. of children	See Figures	% / No. of Children	See Figures
1. Lion	64% (9)	5.5; 5.15; 5.23; 5.3; 5.29; 5.1; 5.12; 5.8; 5.19	43% (6)	5.24; 5.26; 5.4; 5.30; 5.2; 5.13
2. Tiger	14% (2)	5.5; 5.1	7% (1)	5.2
3. Elephant	-		-	
4. Fox	-		-	
5. Wolf	7% (1)	5.29	7% (1)	5.30
6. Rhino for rhinoceros	-		29% (4)	5.4; 5.30; 5.13; 5.9
7. Monkey	-		14% (2)	5.24; 5.30
8. Zebra	-		-	
9. Deer	-		-	
10. Giraffe	57% (8)	5.10; 5.21; 5.15; 5.3; 5.27; 5.1; 5.12; 5.8	29% (4)	5.22; 5.4; 5.2; 5.13
11. Cheetah	-		-	

Numbers in bracket are raw data

Figures 5.1 to 6.6 show sample evidence of three children's spelling and naming by identifying and labelling several wild animals in their drawings.

Figures 5. 1 to 5. 6 Sample evidence of wild animals' named and spelt in pre-and post-lesson drawings by three children

Pre-lesson drawings (D1)	Post-lesson drawings (D2)

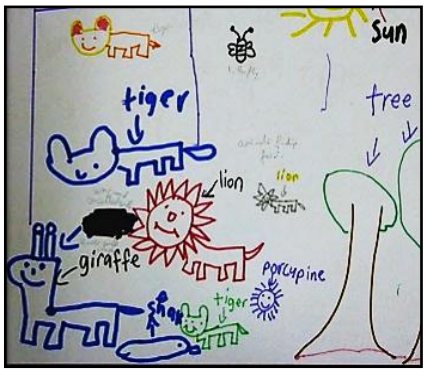



Figure 5.1 (D1 Child P11) Appendix E1 "Tiger, giraffe, lion, sheak (shark) porcupine, tree, sun"	**Figure 5.2 (D2 Child P11) Appendix E2** "Sun, clouds, giaffe, lion, tegr, bat"

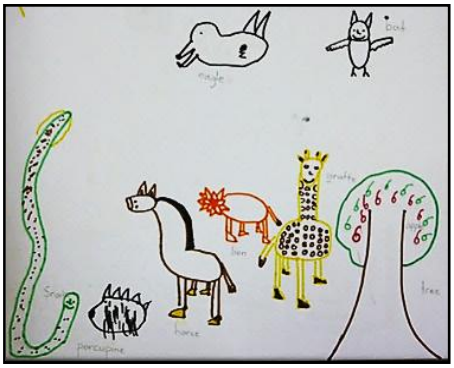


Figure 5.3 (D1 Child P07)
Appendix E3
"Eagle, bat, snake, porcupine
Lion, giraffe, apple, tree"

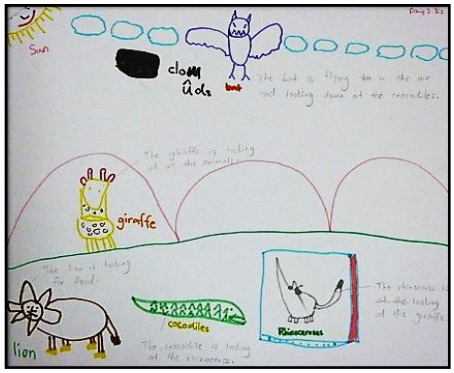


Figure 5.4 (D1 Child P07)
Appendix E4
"Sun, clouds, giraffe, lion, cocodiles,

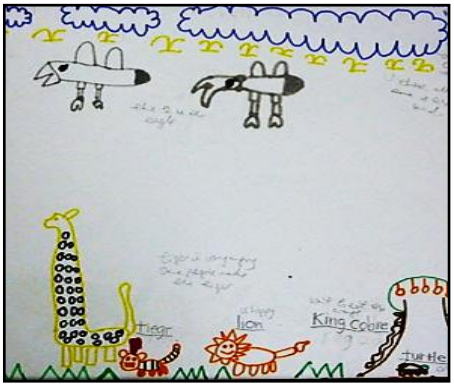


Figure 5.5 (D1 Child P01)
Appendix E5
Tiegar (is very angry some people made the tiger angry), Lion (is happy),
King cobre (want to eat orange),
Turtle (is crawling)

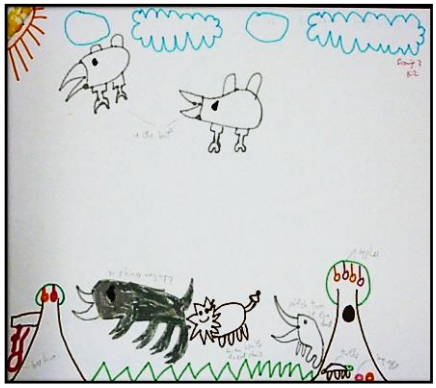
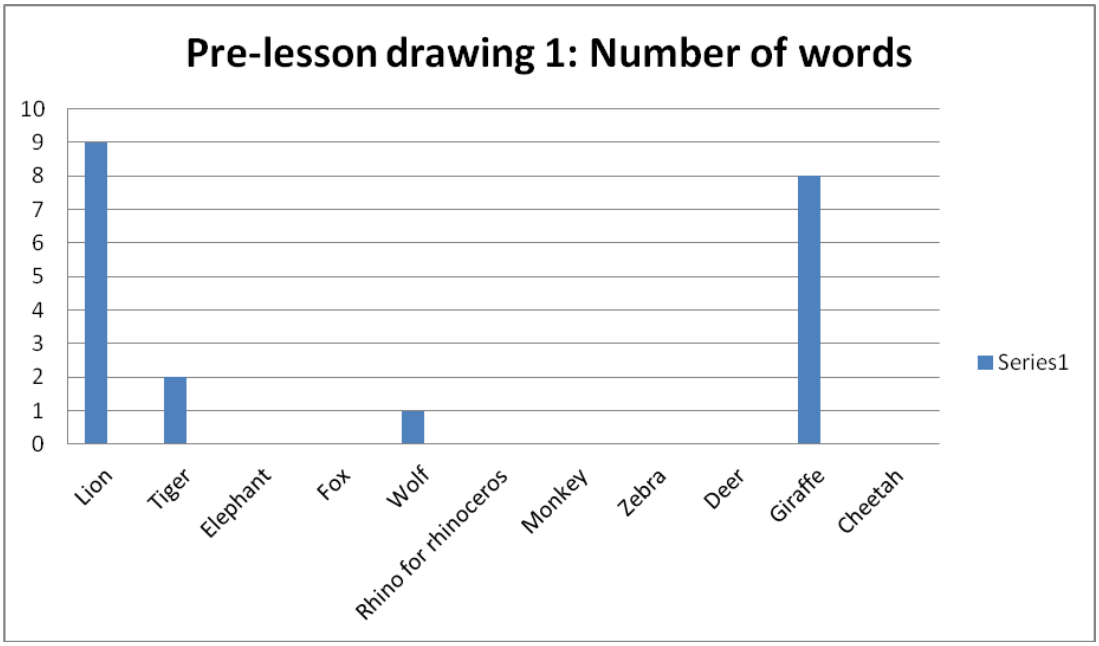


Figure 5.6 (D2 Child P01)
Appendix E6
Named: "Bat, bee hive, rhino very angry; lion, turtle lay eggs"

The pre-lesson drawings showed nine out of 14 children could spell "lion" and eight spelt "giraffe" with little difficulties while only two spelt "tiger" and one child spelt "wolf" respectively correctly. Figure 5.7 summed it up graphically.

Figure 5.7 Pre-lesson drawing wild animals-word list spelt



When the teacher was asked how many out of the 11 word-list that she thought the children could spell independently the teacher's guess was "lion, tiger, and fox" because they are of shorter word-lengths. But the findings proved otherwise. Word-length, especially shorter ones of less than five letters did not seem to be the determining factor. Instead, words like "giraffe," a seven-letter word, was spelt by eight children with little difficulties. Some children also demonstrated the ability to spell beyond the target word-list, e.g. "*eagles, turtle, bear, bat, snake, porcupine, python, horse*," and other peripheral words – "*tree, cub (spelt "cup"), rainbow, and sun*." Pre-lesson drawings revealed children's extensive prior knowledge about wild animals by representing animals within and beyond the word-list such as *"polar bear, koala,snapping turtle, jaguar, zebra, hippo, parrot, snake, cocodiles, cheetah; rhinoceros, tiger and wolf*" (see Figures 5.8; 5.10 & 5.12).

Figures 5.8 to 5.13 D1and D2 drawings on wild animals by three children (P02; P12; and P13)

Pre-lesson drawings (D1)	Post-lesson drawings (D2)

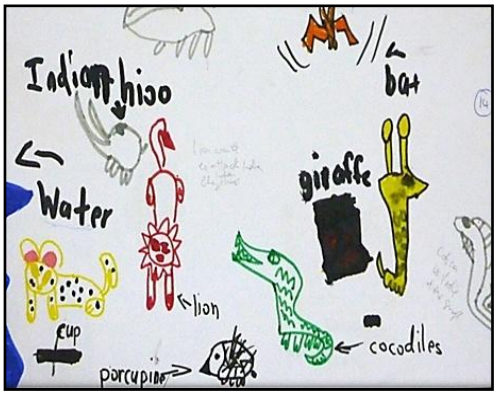
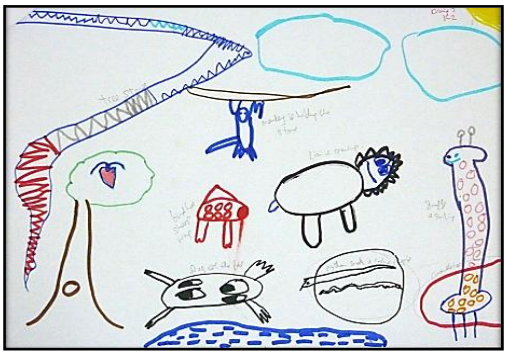



Figure 5.8 (D1 Child P13) Spelt: Appendix E7 "Indian hino (rhino), Cup (cub), Lion, porcupine, Cocodiles, Giraffe, bat, water"	**Figure 5.9 (D2 Child P13) Spelt: Appendix E8** "Bat, 'Wid' (Wild) Animals, Rhinocerses"
	
Figure 5.10 (D1 Child P02) Spelt: Appendix E9 "Giraffe (is eating leaf); Tree"	**Figure 5.11 (D2 Child P02) Named: Appendix E10** "Giraffe, Monkey, Lion, bird has sharp claws; Frog eat food, python is looking people; Giraffe is smiling"

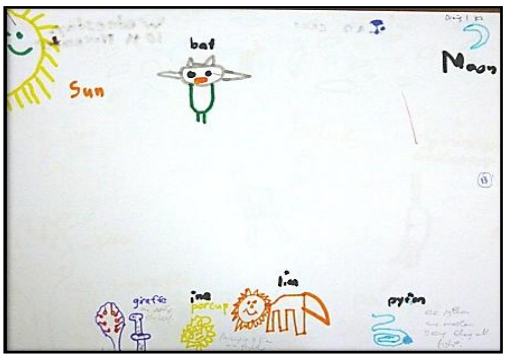
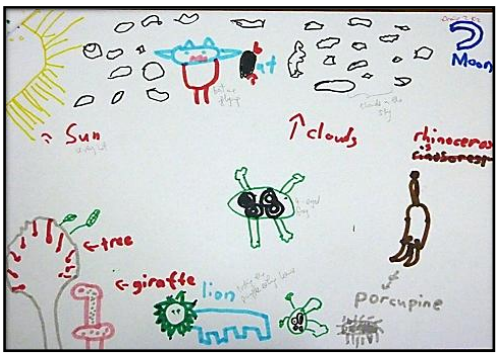
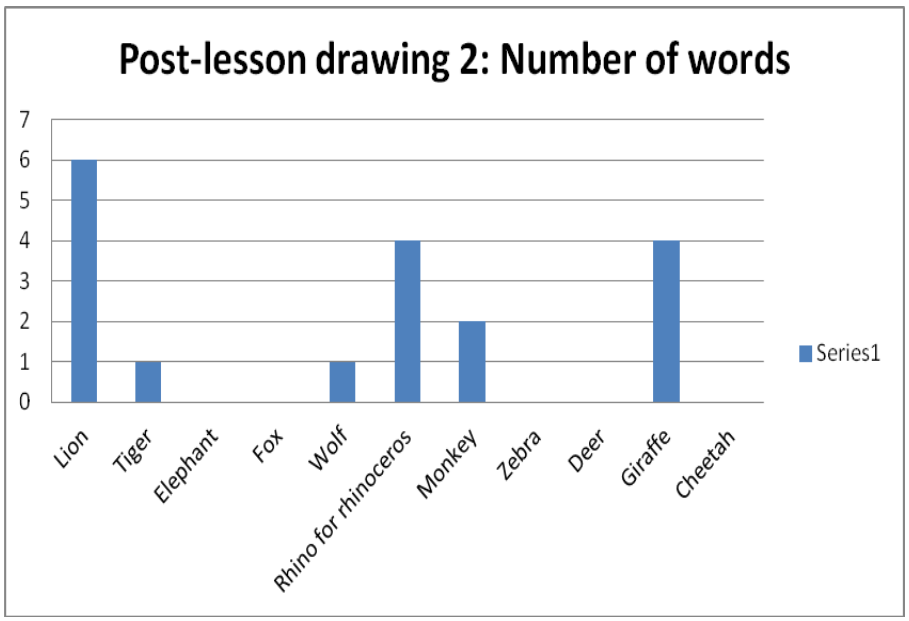

	

Figure 5.12 (D1 Child P12) Spelt: Appendix E11 "Giraffe, porcupine, lion, Python, sun, bat, moon"	**Figure 5.13 (D2 Child P12) Spelt: Appendix E12** "Sun, moon, clouds, bat, rhinoceros, tree, giraffe, lion, porcupine"

For post-lesson drawings (see Figures 5.2; 5.4; 5.6; 5.9; 5.11; & 5.13) there was a drop in the number of children spelling lion and tiger. There were six (three less than D1) who spelt "lion" and one for "tiger" (one less than D1), and four spelt "giraffe" (four less than D1) and one spelt "wolf". However, two additional words were spelt in post-lesson drawings: "rhinoceros" (sometimes, spelt as "rhino") and "monkey" by four and two children respectively.

Figure 5.14 Post-lesson drawing animal-word list spelt



The children spontaneously spelt "*turtle, singapore zoo, crocodile, porcupine, bat and eagle*" not specified in the teacher's word-list. They could verbally identified many wild animals, like "*rhinoceros, monkey, giraffe* and *others such as snake, four-eyed frog, python, hippo, turtle, squirrel, bat, parrot*, and *eagle*." In D1 children showed factual knowledge of labelling and spelling "lion, tiger, wolf and giraffe," four out of the 11 words. By comparison, in D2, children spelt "*lion, tiger, wolf, giraffe, rhino*(ceros) and *monkey*" which were six out of 11 of the lesson objectives. Evidently, children's drawings presented information regarding what children could spell and name independently prior to the teacher's teaching and information retained and remembered by the children after the taught lesson. To conclude, visual evidence in drawings provided clear and specific information of wild animals' names that the children were capable of spelling

independently (four for D1 and six for D2). In addition, drawings also identified evidence of specific children, e.g. children who had evidently spelt "rhino" (child, P07, P09, P12 and P13) and "monkey" (child P05 and P09) in their representations. It eliminated fuzzy teaching assumptions. It offered a clearer direction and focus in teaching and setting achievable lesson objectives to extend children's learning thus, time and resources could be better exploited helping children to progress and gain new information. The drawings had illustrated the children's sophisticated understanding and ability to conceptualize, and draw things related to the wild animals theme (see Figures 5.1 to 5.13). The following discusses children's conceptual knowledge of wild animals.

5.7.2 Children's conceptual knowledge of wild animals within the lesson's scope presented in pre- and post-lesson drawings.

Anderson and Krathwohl et. al. (2001) suggested conceptual knowledge is a "deeper, more organized, integrated and systemic knowledge" than just knowledge of terminology and isolated facts because they "form connecting links between and among classifications and categories" which differ from terminology and facts (pp. 62 and 49). Their proposition was proper classification of information and experience into appropriate categories is the hallmark of learning and development. For Newton (2012), these connections are also the building blocks for understanding. Table 5.3 provides a summary of wild animals conceptual knowledge in pre- and post-lesson drawings.

Table 5.3 A summary of pre- & post-lesson conceptual knowledge of wild animals

Inferred from the teacher's lesson procedures		Pre-lesson drawings		Post-lesson drawings	
Conceptual knowledge of wild animals	**Children's verbal descriptions &/ or visually represented**	**No. of children**	**See Figures**	**No. of children**	**See Figures**
Wild animals need food for survival	*"Finding food;" " wants to eat meat;" "eat leaves;" "eating;" "eating something;" "eat squirrel"*	43% (6)	5.10; 5.15; 5.21; 5.23; 5.25; 5.27	57% (8)	5.4; 5.6; 5.11; 5.9; 5.22; 5.26; 5.28; 5.30
Wild animals attack each other	"Chase;" "attack;" "catch;" "fighting"	29% (4)	5.8; 5.12; 5.17; 5.19	29% (4)	5.2; 5.6; 5.18; 5.28
Sounds of wild animals	"Parrot is singing;" "roar"	7% (1)	5.15	7% (1)	5.16
Feelings of wild animals'	*"Tiger is very angry;" "Lion is happy;" "tiger is tired;" "lion loves this lion becos is cute;" "parrot is angry"*	36% (5)	5.5; 5.15; 5.17; 5.23; 5.27	57% (8)	5.6; 5.9; 5.11; 5.16; 5.18; 5.20; 5.22; 5.30
Wild animals lived in the open	No enclosures drawn around animals	71% (10)	5.1; 5.4; 5.5; 5.8; 5.12; 5.10; 5.15; 5.17; 5.19; 5.25	43% (6)	5.5; 5.11; 5.16; 5.18; 5.20; 5.26
Wild animals lived in cages in a zoo	Enclosures were drawn around animals	29% (4)	5.21; 5.23; 5.27; 5.29	57% (8)	5.2; 5.4; 5.9; 5.13; 5.22; 5.24; 5.30; 5.28
Wild animals' movements e.g. walk, monkey swings, snake slithers	*"Turtle crawls*;" "koala & bear crawling;" snake slithers; pouncing tiger/lion, eagle/bat fly, hippo swims	71% (10)	5.3; 5.5; 5.8; 5.10; 5.15; 5.17; 5.19; 5.23; 5.25; 5.29	93% (13)	5.2; 5.4; 5.6; 5.9; 5.11; 5.13; 5.16; 5.18; 5.20; 5.24; 5.26; 5.28; 5.30

( ) raw number of children.

Figures 5.15 to 5.20 D1 and D2 wild animals by three children (P04; P10; P14)

Pre-lesson drawings (D1)	Post-lesson drawings (D2)

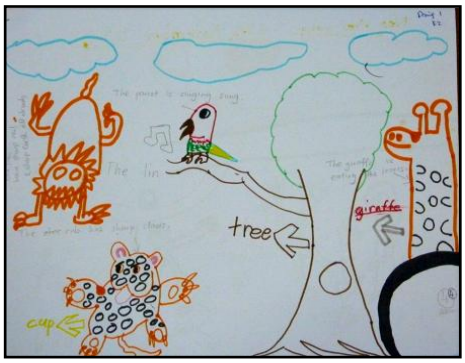



Figure 5.15 (D1 Child P04) Spelt: Appendix E13 *'Cup,'Giraffe is eating leaves Tree, The 'lin'*	**Figure 5.16 (D2 Child P04) Appendix E14** *"The leopard (is roaring); Gila monster (has very sharp nails); The rhino (has sharp nose); Gorilla (is swinging on the tree); Four-eyed frog (can scare the other animal away); Killer whale (is jumping out and down)"*
	
Figure 5.17 (D1 Child P10) Appendix E15 *"Eagle-Bee sting eagle so got plaster Bat, Squirrel, Orangutan climb the tree, Hippo, lion wants to chase the tiger* ***Tiger snake, Tiger rhino snake"***	**Figure 5.18 (D2 Child P10) Appendix E16** *"Bat wants to fly on top to bump the lion; Lion want to scare the porcupine fish; Porcupine fish, plaster"*
	
Figure 5.19 (D1 Child P14) Appendix E17 *"The eagle is flying down towards the parrot; The fly 'doke' the eagle, Mosquito / plaster; The eagle is eating the mosquito''*	**Figure 5.20 (D2 Child P14) Named Appendix E18** *"The baby parrot eats the diaper?"*

The pre-lesson drawings (see Figures 5.1; 5.3; 5.5; 5.8; 5.10; 5.12; 5.15; 5.17; & 5.19) showed evidence of children's prior knowledge of wild animals listed in Table 5.3. This prior knowledge appears more complex than the teacher allowed for. Firstly, the drawings illuminated children's perception of wild animals in two different contexts – animals in the open (safari) or in enclosures (zoo). Animals were drawn in association with phenomena like the sun, a rainbow, trees, clouds and with or without boundary of closed shapes drawn around animals. Secondly, another interesting aspect was five children attributed feelings of "anger" and "happiness" to depict the emotional states of animals. A teacher equipped with children's prior knowledg could follow this up by building on the children's interest to learn about animals' emotions, in addition to animals' sounds and movements, topics commonly taught in class. A possible topic of discussion is "Do animals' have feelings? How do they express their feelings?" While at least ten out of 14 children showed adequate knowledge of animals' movements (e.g. walking, stalking, pouncing, slithering, swinging, and flying). These were either narrated or visually represented showing understanding by classifying animals on different baselines: air (e.g. eagle, bird, parrot), land (e.g. tiger, lion, bear) and reptiles drawn closer to the ground (e.g. snake, python). It clearly demonstrated children's knowledge of classifications. Four children showed prior knowledge of the savage realities of wild life – they "attacked" each other for survival (see Figures 11, 7, 14, 16) this concept was implied by their choice of action words to describe survival , "*chase; attack; catch; and fighting*."

5.7.3 Children's unique concepts of wild animals outside of the lesson's scope presented in pre- and post-lesson drawings.

Table 5.4 summarises the children's unique ideas about wild animals presented in the pre-lesson drawings. These concepts were unique because they were rooted in individual children's interpretation, exploration and generalization from their own experiences to the animal world. In addition, these concepts visually represented were most probably not covered or even considered as possible topics in the school curriculum.

Table 5.4 A summary of the children's pre-lesson unique concepts represented outside of the lesson

Unique Concepts – alternative topics	Characteristic descriptions	See Figures
• **Role of a master/leader**	*"the python are master seeing they all fight – lion and porcupine are fighting"(child P12)*	5.12
• **Injured animal and plaster**	*Child (P14) explained specifically that eagle had a plaster on its body "becos fly doke (a colloquial expression for prick) the eagel".* *child (P10) "eagle got plaster, the bee sting; got bee sting"*	5.19, 5.17
• **Growth and develoment of animals**	*"Daddy rhino is behind the gate; baby rhino nose is very small one, baby rhino horn is growing"*	5.21
• **Animal family unit**	*"daddy, mummy and cub"* *"mother giraffe haven't born a baby yet*	5.31,5.15,5.8
• **Self-correction in labelling**	child cancelled "girrffe" and another child intensely cancelled with a black marker and child P09 left behind traces of an erased word "eglel"on the drawing paper.	5.1, 5.10, 5.27
• **Creating a hybrid animal**	*"Tiger rhino snake"* *"Tiger snake"* with a fork tongue	5.17
• **Pathway-map-like**	To track where people come and go from enclosure to enclosure	5.27

One child even defined the role of a master or leader (see Figure 11) "*the python are master seeing they all fight – lion and porcupine are fighting"*(Child P12). Although, this was expressed by one child, it warrants attention in curriculum development by adding an interesting topic, "Are there leaders in the animals' kingdom?" which may not be as popularly explored by the teachers in comparison with topics on animals' movements, habitats, coverings and sounds. The children were also exploring shared ideas of "injured" animals (see Figure 5.19), child (P14) specifically pointed out that the eagle had a plaster on its body "*becos' fly 'doke'" ("stung") the eagle"* and child (P10) explained "*eagle got plaster, the bee sting; got bee sting"* (see Figure 5.17). Another child (P03) showed prior concept of growth and development in terms of size changes in animals to represent the various statuses within a family unit (e.g daddy, mummy and cub; see Figures 5.31;5.15;5.8). He interpreted by inferring and explaining causal-effect *"mother giraffe haven't born a baby yet; Daddy rhino is behind the gate; baby rhino nose is*

very small one, baby rhino horn is growing" (see Figure 5.21). The same child, in his post-lesson drawing, drew an analogy of growth using trees *"this tree (7 yrs old) larger than this tree (6 yrs old)"* (see Figure 5.22). This child's schematic interest in "growth and development" was consistently represented in the pre-and post-lesson drawings explored from different perspectives. It definitely deserves the teacher's attention to extend and challenge the child's learning.

Figures 5.21 to 5.30 D1and D2 wild animals drawings by five children

Pre-lesson drawings (D1)	Post-lesson drawings (D2)

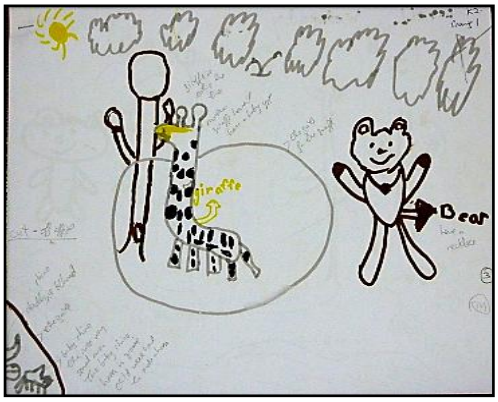
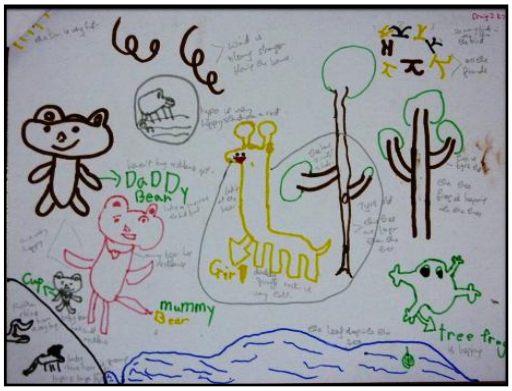

	

Figure 5.21 (D1 Child P03) Appendix E19 *"Mother giraffe (haven't born a baby yet); Baby rhino nose is very small one, baby rhino horn is growing"*	**Figure 5.22 (D2 Child P03) Appendix E20** ***"Baby rhino horn is growing longer & longer;*** *This tree (7 yrs old) larger than this tree (6 yrs old)"*
	
Figure 5.23 (D1 Child P05) Appendix E21 *"Laocoon is sleeping, Tiger is tired Snapping turtle is eating something Eagle is flying"*	**Figure 5.24 (D2 Child P05) Appendix E22** *"The monkey is hanging on the tree the lion is sleeping; The turtle lay eggs"*

Figure 5.25 (D1 Child P06) Appendix E23
"Squirrel takes nuts put inside the tree hole; Butterfly (nectar, flower, fly away) Tiger eat squirrel; Lion eat the leaf Snake finding food; Tortoise crawls"

Figure 5.26 (D2 Child P06) Appendix E24
"Bird flying to the tree Squirrel climbing the tree to take the nut Lion talking to the butterfly Rhinoceros & panda want to find food"

Figure 5.27 (D1 Child P08) Appendix E25
"Leopard, Jaguar, Giant panda Polar bear, giraffe eating the leaves zebra has stripes on its body; king cobra very angry because it wants to eat meat"

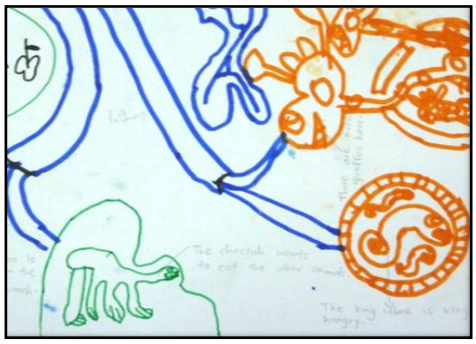


Figure 5.28 (D2 Child P08) Appendix E26
"The cheetah wants to eat the other animals; coral snake is looking for food; There are three giraffes here King cobra is very hungry"

Figure 5.29 (D1 Child P09) Appendix E27
"Lion, wolf, turtle,King cobre (cobra) Child self-corrected and erased "Eglel"

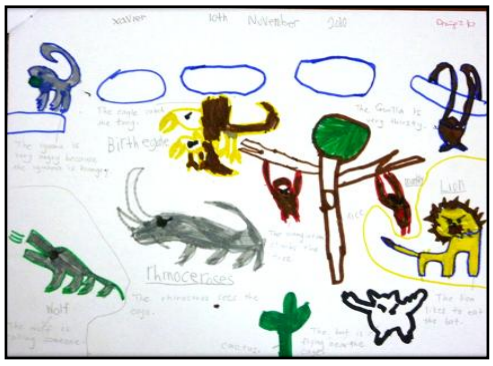


Figure 5.30 (D2 Child P09) Appendix E28
"Iguana very angry becos' iguana is hungry Eagle catch the twig; gorilla very thirsty Orangutan climbs tree; rhinoceros sees cage; Bat is flying near cactus; lion likes to eat bat The wolf is calling someone."

Figures 5.31 to 5.33 Evidence of self-monitoring/correction in labelling

Figure 5.31 Appendix E1 self-corrected by cancellation

Figure 5.32 Appendix E9 self-corrected "girrrfe"

Figure 5.33 erasure trace Appendix E27

Children's drawings offered visual feedback that promote self-monitoring and correction. A child corrected "girrffe" (Figure 5.32) and another child blacked out his mistake with a black marker (Figure 5.31) and child P09 left behind traces of an erased word "eglel"on the paper (Figure 5.33). Donaldson, (1978) suggested that error plays a highly "constructive role in the development of thinking" and it could be a sign of progress because errors are essential to learning (p.110). Forman and Kuschner (1983) also pointed out that error functions to ensure "new knowledge is coordinated with old knowledge" (p.51 cited in Holt, 1989, p.25). These children obviously showed development of thinking in recalling and coordinating letter-word matching with old knowledge of the correct spellings once taught. Could such constructive self-monitoring be facilitated in Question & Answer (Q & A) session? Most probably the corrections would be made by the teacher who keeps a close look out for the correct answer!

Vygotsky (1969) observed the importance of learning in a socio-cultural context where the more competent others teach and model instruction to their less competent peers. In a classroom setting with children seated side-by-side they learn by copying each other's ideas (e.g. ideas of a plaster on the eagle's body; see Figures 5.17; 5.19; & 5.20). The children drew an analogy of a plaster aid band from their experiences of a mosquitoe bite and transferred that idea to an eagle stung by a bee! They giggled at the thought of a plaster aid on an eagle's body. Another child constructed a hybrid animal (Figure 5.34), drew orange stripes on a snake's body and proudly labeled *"Tiger snake*" with a fork tongue. The *"Tiger rhino snake"* was a combination of grey stripes (for tiger) with two horns (for rhino) and a fork tongue sticking out (for snake).

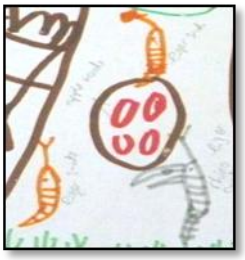


Figure 5.34 (D1 Child P10) Appendix E15 "Tiger rhino snake"

The discussion so far has shown that in drawing children were more or less in control of how he/she chooses to construct knowledge, demonstrating cognitive flexibility, creativity and drawing analogies to challenge their own thinking and imagination. Figures 5.27 and 5.28, child P08 drew pathways likened to a zoo map to determine where people come from and where they go from enclosure to enclosure. Matthews (1999) suggested children like to track where things come from and where they go. Hope (2008) pointed out such children showed intuitive understanding of "geometrical concepts of size, shape, distance, angle and movement" (Hope, 2008, p.122). He suggested it displayed growing sophistication of a child's understanding the perimeter of three-dimensional pathways and the ability to transfer that understanding to paper, and that it "is an important prerequisite for more formal geometrical analysis later" in topological understanding of mazes, linked to the "study of loci, movement and path to create, record and communicate movement, routes and paths" (p. 123 & 132). Such explorations are made possible in visual representations or through play. Drawing is interactive play with lines and marks, ideas and mental pictures forming in a child's mind. It can inform our thinking about a child's perspectives such as the unique concepts or prior knowledge of wild animals discussed in Table 5.4.

Drawing allowed children to express a lot more interesting information than the articulation of thoughts through "Question and Answer" alone. The next section

discusses apparent changes in conceptual knowledge revealed in the post-lesson drawings (see Table 5.3). There was a 14% (2) increase in children represented knowledge of wild animals' survival strategies. For example, child P01 explained "*lion wants to eat rhino*;" (Figure 5.6); child P07 and P08 expressed respectively the "*lion/cobra snake is looking for food;"* (Figures 5.4 &5.27); child P14 "*tiger is very angry becos there's no food to eat*;" (see Figure 5.16); *"The cheetah wants to eat the other animals"* (Figure 5.28); and lastly, child P11 inferred by explaining *"tiger going to eat lion but the gate prevent tiger eat lion*" (Figure 5.2) an understanding of causal-effect by determining not only notions of "attack" but also the function of a gate – it separates and keeps danger out of the way showing concepts of inside-outside topological relationships. For "animals' feelings," 21% (3) more children attributed feelings to animals "*hippo is very <u>happy</u>* (Figure 5.22);" "*bat <u>love</u> to fly around* (Figure 5.30);" "*giraffe <u>love</u> to see the rhino; bat love to eat fruits* (Figure 5.8)." There were 22% (3) more children represented and described animals' movements. They drew animals standing still and looking at each other; monkey was either *swinging or hanging* from a tree branch; bats *flying;* snake *coiled* around a branch; a turtle *laid* eggs or even a shark *shooting* out of water; indicated with metaphor (travelling arrows) (Newton 1985) to show where it came from and where it landed back into the ocean (Figure 5.16). An interesting finding was after the teacher's lesson an increase 28% (4) represented animals within enclosure and boundary for caged animals in a zoo. A child labeled "Singapore zoo" (Figures 5.2; 5.4; 5.9 and 5.13) a different idea from her pre-lesson drawing and showed drawing on personal experience. However, there was no change in the number of children representing ideas of attack or sounds of animals.

In addition to these common ideas, many other complex ones related to wild animals not taught by the teacher were expressed in the post lesson drawings. These ideas are summarized in Table 5.5.

Table 5.5 A summary of the children's post-lesson unique concepts outside of the lesson

Unique Concepts – alternative topics	**Characteristic descriptions**	**See Figures**
Growth and changes in size relations	• *"Big tiger born this tiger; giraffe haven't born baby."* • *"Father rhino horn is very long; baby rhino horn is growing longer & longer;"* • *"Daddy giraffe is very tall"* • *"Baby giraffe drinking water"* • *"Birth eagle"*	5.2; 5.9; 5.22; 5.30
Conceptual differentiation between 'looking at' (watching) and 'looking for' (search) has literacy implication. **The differential application of prepositions sensitized children to the differentiations of meanings and concepts**	<u>Looking at:</u> • *"Giraffe looking at bear."* • *"The giraffe is looking at all the animals;"* • *" The crocodile is looking at the rhinoceros;"* • *"The rhinoceros is looking at the giraffe;"* • *"Lion is looking giraffe eating leaves"*	5.22; 5.4; 5.13
	<u>Looking for:</u> • *"The lion is looking for food;"* • *"The coral snake is looking for food;"* • *"The coral snake is a reptile"*	5.4; 5.28
Sun and heat intensity	• The child drew three suns to represent a really hot desert • *"Sun is very hot "*	5.26; 5.13
Personal attitude expressed - Empathy	• *"Bat love to eat fruits; but is angry because he cannot get out of these places; bat cages"*	5.9
Injured animals and plaster	• Plaster on lion's face • Plaster on eagle's body	5.18
Evaluate – detecting inconsistencies and humour	• *"The baby parrot eats the diaper"* and the child included question mark (?) to indicate its silliness (P14)	5.20

The post-lesson drawings presented children's fascination with animals looking at each other. They considered an activity worth recording in their drawings in visual and narrative forms. Most of the children drew animals in close proximity and specifically pointed out to the investigator "*the animals looking at each other* " - "*The giraffe is looking at all the animals"; " the crocodile is looking at the rhinoceros; the rhinoceros is looking at the giraffe"* (Figures 5.4 and 5.28). Piaget (1969) suggested children perceived a reason for everything even though it may seem illogical from an adult's perspective. Drawing facilitated some form of linguistic insight. For example, it probably sensitizes children to the different forms of a word. In this case, the preposition looking *for* and looking *at* helps children to differentiate between "hunting" and "watching" intentions, the children seemed to figure it out visually by themselves.

Drawing presents to children representational issues to resolve - how could one depict the intense heat of a desert or a safari? Child (P06) resolved the issue by drawing "three suns" spaced across the paper on the far left, right and middle to depict the intensity of hotness in a desert and time passing (see Figure 5.26) a child's naïve representation of a safari was the best solution for the child! While child (P14) detected illogical fallacies of "*the baby parrot eat(s) the diaper*" giggling, she added a question mark above the parrot's head to indicate its absurdity (Figure 5.20). Hope (2008) suggested a child's sense of visual humour depended on departure from the norm, on incongruence or on a surprise. It was obvious the girl was actively interacting with visual ideational symbols emerging before her; evaluating and challenging her own ideas. Although the above discussion has identified unique perceptions of some children's ideas, these have a bearing on how teachers teach and children learn in a meaningful context.

Another consistent finding from the pre- and post-lesson drawings was the children showed special interest in the "bat" (Figures 5.2, 5.3, 5.4, 5.6, 5.8, 5.9, 5.12, 5.13, 5.17, 5.18, 5.23, and 5.30) and the "eagle" (Figures 5.3, 5.5, 5.16, 5.17, 5.19, 5.20, 5.24, 5.29 and 5.30). It may be worthwhile for the teacher to consider providing a focus on these two animals. The drawings revealed information of children's limited knowledge of an eagle – it was drawn bigger, having more feathers than an ordinary bird and the bat hanging upside down or represented standing in an upright position with spread out "wings." Information about

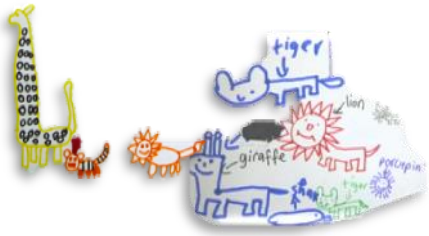
children's special interest has implications for how well and how much children pay attention in class to learn from the lesson because children's interests and prior knowledge are gateways into knowledge acquisition. This belief was echoed by at least 35% of the 325 teacher-respondents (see Chapter 4).

5.7.4 Children's representational strategies and marking structures.

Next, look at some of the drawing strategies children devised to construct meanings that signified development and learning. Interpretative frameworks include works by Piaget (1929), Matthews (1998; 2003) and Willats (1997; 2005). For example, Piaget's postulated stages of drawing development in young children. Of relevance is Stage 3, intellectual realism or object-centered (the child draws what he/she knows and not seen from a particular viewpoint) and Stage 4, visual realism or view-centered (the child draws what he/she sees from a particular viewpoint and not what they know). These stages concurred with Piaget's stages of cognitive development related to children's mental capacity for conservation, "the idea that some characteristic of an object stays the same even though the object might change in appearance" (Santrock, 2004, p.43). Hope (2008) commented that "drawing holds meaning contained within the form of the lines..." (p.8); the form of lines referred to children's representational strategies or syntax organized to frame meanings. It illuminates how children think and perceived things in their environment. Children's thinking processes could not easily be captured by a coding checklist mapped to the teacher's lesson objectives because it captured only information of content-knowledge. This goes to show that there is more to children's drawings than content-knowledge (see Chapter 2). In order to understand children's minds at this point an aid like Bloom's taxonomy could be used to elicit and study children's representational strategies.

Figure 5.35 summarises the different visual representational strategies and structures the children employed to capture ideas of wild animals.

Figure 5.35 Visual representational strategies children used to represent concepts of wild animals

Drawing strategies	See Figures	Conceptual Significance
Intellectual realism Canonical views	   cheetah  	Children represented these animals in conventional established side or profile views. These figures showed drawings of two-or four-legged animals. The legs were drawn almost of equal lengths parallel to each other. These are intellectual realism drawings. The children drew what they know and not what is seen from a viewpoint therefore they represented four legs in a row instead of two as hidden from view.
Visual realism Occlusion	 Giraffe's body was occluded to represent body was hidden from view (behind the gate/enclosure).  The child was able to represent the animals' legs from a view point by showing different leg-lengths (near-far viewpoints) yet still preserving the information that animals' have four legs  A gorilla swinging on branches. It's arm was partially drawn hidden behind the branch showing understanding of occlusion.	The ability to represent from a view point demonstrated the child's cognitive abilities to hold a mental image of the hidden features.

Intellectual realism

X-ray drawings

Young children with object permanence difficulty, preferred to preserve the whole entity resulting in a see-through (X-ray) effect of objects cutting right through each other.

The partial closed shape (a semi-circle) to represent enclosure cutting right through the snake and giraffe. The branches cutting right through the python and bat's limbs; monkey and gorilla's arms.

Visual realsim

Frontal views

Frontal views in which the animals' bodies were foreshortened - almost compressed into volumetric (3-D) whole showing it head-on which may sometimes looked distorted in comparison to cannonical views (Willats 1997). This was an advance drawing strategy indicative of a child's ability to hold a mental 3-D image of the animal and not perceived it as distorted.

Cut-off views		a partial cut-off view of father rhino's horn is very long	An advanced drawing strategy in which the child was able to hold a mental picture of a rhino's body continuing to exist beyond the paper frame. Piaget suggested it was a challenge to young children because they had difficulty to hold a mental image of object permanence because of out of sight; out of mind effect. Sometimes, the child explicitly explained that "you cannot see the body becos the gate block it".
		Giraffes' bodies were cut off	
Intellectual realism Fold-out views			Child drew what they know rather than what they saw from a view point. These children demonstrated knowledge of a four-eyed frog, a cub and a gila monster with four legs in a spread-out manner.
Travelling lines, dots, and arrows or visual metaphors (Newton, 1985) to indicate movements through space and time			To demonstrate knowledge of movements through space and time (temporal and spatial concepts) e.g. shark shooting out of water and howling wind blowing the leopard; butterfly carrying away nectar from a flower; a flying bat; a shining butterfly

Children drew with intent to construct meanings and to make sense of what they had observed in their environment. Therefore, the above drawing strategies are syntax or grammar of visual representations that give meanings to children's mental capacity and perception (Piaget, 1929; Matthews, 1999; Willats, 1997). Within these children had carefully selected to frame their thoughts in pre and post-lesson drawings.

Pre- and post-lesson drawings' findings are summarized in Figure 5.36. It shows negligible change in knowledge between the pre- and post-lesson drawings. This is a concern because it shows teacher's 45 minutes of teaching hardly had any impact on the children's learning. The children seemed to exploit learning informed by their prior knowledge to generate concepts of wild animals rather than guided by the teacher's lesson. The drawings showed the children were still very much occupied with their schematic interests and reflected little changes in conceptual knowledge except over limited factual knowledge gained from the teacher's lesson.

Figure 5.36 Pre-(D1) and post-lesson (D2) drawings' information comparison

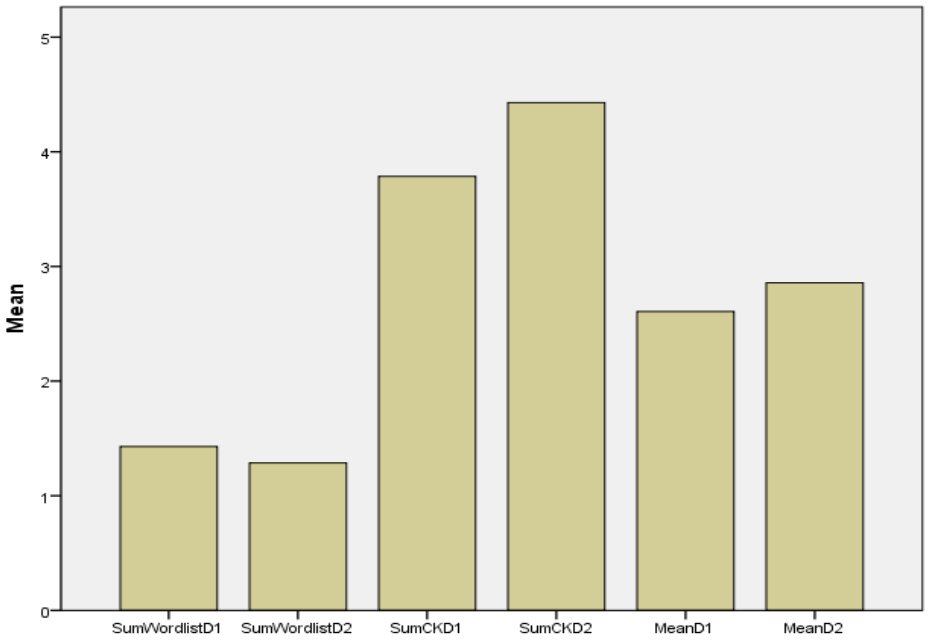


Table 5.6 Descriptive statistics for Pre-(D1) and post-lesson (D2) drawings comparision

Descriptive Statistics

Items/Legend	N	Minimum	Maximum	Mean	Std. Deviation
Sum Wordlist Drawing 1 (D1)	14	0	3	1.43	.852
Sum Wordlist Drawing 2 (D2)	14	0	4	1.29	1.437
Sum Conceptual Knowledge (SumCKD1)	14	1	5	3.79	1.122
Sum Conceptual Knowledge D2(SumCKD2)	14	3	6	4.43	.852
Mean Drawing 1 (MeanD1)	14	2	4	2.61	.446
Mean Drawing 2 (MeanD2)	14	3	5	2.86	.602
Valid N (listwise)	14				

5.8 Discussion

Hein and Price (1994) classifed drawing under active assessment because it actively engaged learner in problem solving and decision making to select representational strategies that best frame and communicate meanings and intentions. The results demonstrated drawings could provide comparative yet specific information of individual as well as whole class performace on:

- the number of words and animal-word(s) spelt correctly;
- the children's general conceptual interests and perception (e.g. on growth or working out ideas about injured animals or animals' feelings); and,
- the children's limited knowledge of specifics that interested them (e.g. bat and eagle)

Children experienced moment by moment shifts in thinking and conceptual priority while drawing because mental activities are dynamic. Thus, the findings have presented drawing is a vehicle children use to think with and work out ideas, showing their potential as sources of evidence of learning. The research aimed to

show what children know and can represent in drawing can serve as information for teachers in classroom practices and as such, has succeeded.

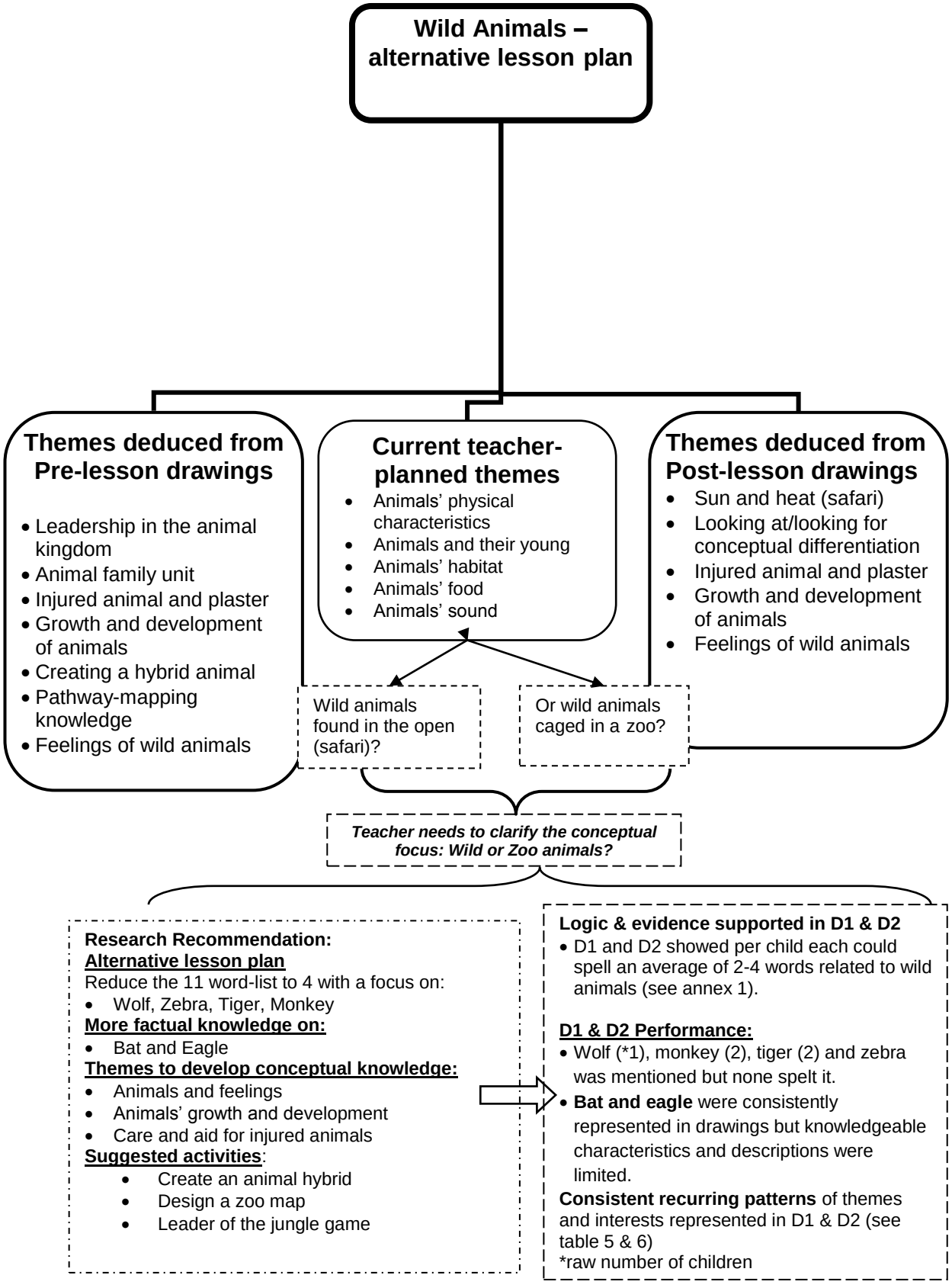
These findings have implications on curriculum planning and setting appropriate lesson objectives to challenge and build on children's prior knowledge. Moreover, it has implications for time and resources allocation in terms of what to teach and how best to teach it. Driver, Guesne and Tiberghien (1985) suggested that knowledge of children's predominant conceptions were significant to planning and teaching specific topics (p. 197). What were the 14 children's predominant concepts of wild animals? (see Figure 5.37) Driver et. al. (1985) underlined the importance of looking into children's prior knowledge so that relevant and specific topics were planned to facilitate effective teaching and learning that allowed children to construct their own meanings. They also suggested very young children already had "something in their heads" that played a role in their learning experience (p. 4) and these ideas may seem "incoherent" but "stable" thus teachers need to discover the persistent "general trends in children's thinking" (p. 8). This view was also supported by Bar (1989) who proposed that "a structure can be found within the child's ideas" that was very stable even when contradicted by the investigator (p.494 and 498). Figure 5.37 diagram summarized the general concepts/trends deduced and categorised into three themes teachers could use as ideas for curriculum planning:

- Animals and feelings: to develop positive attitudes in children, such as empathy;

- Animals' growth and development: may cover information about specific animals like the wolf, monkey, bat, or eagle, related to the word-list and supported by information about children's interest and,

- Care and aid for the injured animals: veterinary and wild life conservation.

Figure 5.37 Themes deduced from the drawings and research recommended alternate lesson plan



The information deduced provided ideas for active learning tasks e.g. create an animal hybrid; design a zoo map; play a jungle food chain game. Qualter's (1996) idea of finding starting points in teaching - that it was possible to identify a limited number of recurring ideas expressed by different members of a class of children based on the concepts the teacher wants to promote. Qualter's (1996) also commented "collected drawings offered some ideas of the general way of thinking that the children in the class have" (p.61). So far, findings on wild animals drawings showed "children do learn from one another, and do 'bounce ideas' off one another" revealing the general way children think about wild animals that could serve as starting points for planning meaningful lessons to enhance communication in the classroom (Qualter, 1996, p.57).

The findings also presented lesson starting points drawing on children's ideas are more innovative and relevant to children's interests. Children's expressed interest in the growth and development of animals were directed at specific perceptual features of length, height and size of a rhino's horn, and giraffe's height. Russell and Watt's (1990) [1]S.P.A.C.E project on growth shared similar findings. They found children saw growth simply as an increase in various dimensions of an organism – "height, length, volume and mass" (p.36). Drawings captured children's immediate conceptual priorities and schematic interests of concern that required sensitive adults to extend and challenge. If not teachers miss the opportunity to learn about children's learning.

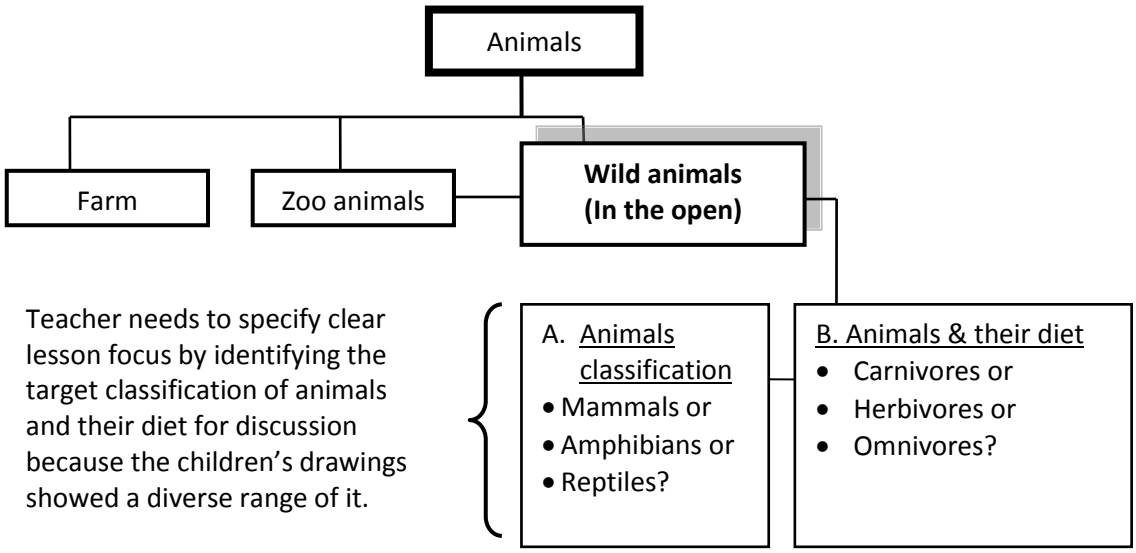
Another interesting finding was an increase 29% (4) children drew animals in enclosures (Figures 5.3 & 5.4; 5.1 & 5.2; 5.12 & 5.13; 5.8 & 5.9) for post-lesson drawing. During lesson observation, the teacher did not specify whether she was discussing about zoo or wild animals in the open. Instead there seemed to be an information overload of explaining animal types (mammals, amhibians, reptiles, carnivores) and animals' habitat (ocean, zoo, cold places, North/South America, desert and mountains) guided by "My first book of animals." Children's prior ideas seemed more creative and spontaneous than after the teacher's lesson (this was also a point made by some 140 teachers who had evaluated the drawings with Bloom's

[1] Science process and concept exploration project

TEO, see Chapter 7). Was it an effect of drawing fatigue at post-lesson drawings? The details in post-lesson drawings proved otherwise (See Appendices E1 – E28) .

The drawing information also provided ideas for concept mapping in lesson planning. Conceptual understanding is the key to learning. It was meaningless and near impossible to learn about names and spellings of animals without a mental picture of the animals for children to latch onto conceptually. Hein and Price (1994) suggested it was important for teachers to make known to the children, specifically and clearly, the lesson objectives and expectations for learning to happen. Newton (2012) also emphasized the importance of making the "construction of an explanation a more systematic and more conscious process" to support understanding because clear explanations provide conceptual structures that support mental structures (p.38). Figure 5.38 shows a concept map, a visual presentation of a concept's connections and hierarchical organization (Newton, 2000).

Figure 5.38 Concept map as a teaching strategy



Why could concept maps help as a teaching strategy? The drawings revealed mixed conceptions of wild animals, either caged or living in the open. It was important for the teacher to identify the animals category (caged or wild), animals type and diet to help children to simplify, to think clearly and to remember to make appropriate associations. Based on the teacher's 11-word list, her focus was on mammals and

carnivores but her lesson procedure was extensive covering habitats to the different animals types and diet in addition to teaching the 11 animals. The drawing evidence showed only one child out of 14 at post-lesson drawing mentioned, "*the coral snake looking for food. The coral snake is a reptile."* Most children showed knowledge of giraffes being herbivores by drawing a tree next to a nibbling giraffe. To begin teaching with a concept map is a good strategy because it supports the principles and conditions of how children learn from the general to the specific, the familiar to the unfamiliar (see Chapter 6 for more discussion). Bransford & Vye, (1989) summed up the findings that illustrate " 'mental ability' is not some general propensity for storing information. Instead, our abilities to remember depend strongly on the nature of information we have previously required" (p. 177). Therefore, children's drawings when taken seriously, provide insights into their concerns and priorities that could guide teachers to teach with connections to children's prior knowledge.

5.9 Conclusion

The drawing-evidence showed quantitative and qualitative information of children's prior knowledge and spontaneous concepts, content-knowledge of animals' names and some spellings. Hein and Price (1994) argued that drawing is a powerful means for pre- and post assessment, a view supported by the S.P.A.C.E project and other researches. The drawings have provided evidence of children's spontaneous scientific knowledge of how living things interact in three basic ways:

- animals co-operate with each other (friendship, play, looking at each other)
- animals compete with each other (for food, shelter, space)
- some animals eat others (predator and prey)
  (Nuffield primary science:SPACE, 1997, p.25)

However, the findings also showed that the teacher's lesson had little impact on the children's learning. Most probably it was due to the teacher's lack of knowledge of children's starting points, and planning without clear guidance by a concept map. As a consequence the lesson made neligible difference to children's

knowledge-base evidential in the pre-and post-lesson drawings. Therefore, to propose drawings as an alternate strategy to inform classroom practices may be the way out to the 325 teacher-respondents obliged to work to a prescribed curriculum.

Chapter 6 Research Component II Children's Thematic Drawings: Water Cycle - Findings and Discussion

This chapter is part of research component II it presents findings on the water cycle thematic drawings.

6.1 Research Component II Aim

This chapter aims to discuss the investigation of children's drawings as a means for eliciting information to inform teachers' practices with a different sample of children and lesson theme to the previous chapter.

6.2 Methodology

Chapters 3 and 5 described the methodology. The investigator visited the kindergarten on 23, 30 March and 6 April 2011 a weekly schedule dictated by the teacher's lesson plan on the "Water cycle." Therefore, the same drawing instruction given for pre-and post-lesson drawings was *"draw what you know about the water cycle."*

6.3 Sampling Procedures

A Singaporean kindergarten was approached by the investigator who was drawn to its very different dynamics compared to a full-day childcare centre (see Chapter 5). It was a Methodist church-based kindergarten, offering two separate sessions of a three-hourly thematic approach curricular classes (see Appendix A; Singapore preschool curriculum) located in central, Singapore. The children were from middle and upper middle income families.

6.4 Participants' Characteristics

The participants were 11 children (seven girls and four boys) aged 5 - 6years, average age was 5 years 5 months at the point of research. The ethnicities were ten English-speaking Chinese Singaporeans and one English-speaking Korean girl. The participating teacher was Chinese with five years of teaching experiences. Her professional qualification was a Diploma in Early childhood education (Teaching) with previously 12 years in engineering. The kindergarten's total capacity was 110 children ranging from 3 to 6 years old. Teacher-child ratio was 1:17. The principal and teachers jointly planned the yearly curricular themes such as "My family;" "My school;" "Water;" "Simple machines;" "Light and Colours." However, the teachers wrote and planned their own individual class lessons integrating with literacy, creative arts, maths and science for each theme.

6.5 Measures

A coding checklist (see Table 6.1) mapped to the teacher's lesson objectives was designed to evaluate pre- (D1) and post-lesson drawings (D2) for factual knowledge, "*to identify stages of the water cycle - evaporation, condensation, precipitation, and collection*." The coding checklist criteria for conceptual knowledge were aligned with the lesson procedures (see Appendix F, teacher's lesson plan). Items in the checklist were checked according to evidence found in the drawings. The coding checklist (see Appendix F24) was used to evaluate 11 pre- and 11 post-lesson drawings to triangulate with findings of the Bloom's taxonomy of educational objectives (TEO) checklist in Component III, designed to teach preschool teachers to evaluate by reading information from the children's drawings (see Chapter 7).

Figure 6.1 Picture-word label matching/sequencing activities

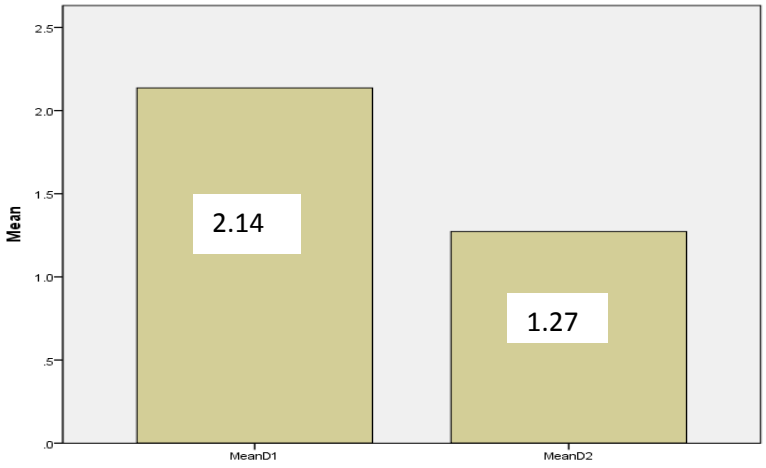
Table 6.1 The water cycle information coding checklist

Factual knowledge	**Pre-lesson Drawing (D1)**	**Post-lesson Drawing (D2)**
1. Cloud to begin 2. Dark clouds 3. Rain or raindrops 4. Collection of water e.g. river, sea, ocean, pool, puddle 5. Sun 6. Wind 7. Landscape 8. Lightning/thunder (optional) Others		
Conceptual knowledge		
1. Precipitation – rain comes from the clouds 2. Evaporation – the sun heats up/dries up water 3. Condensation – cold water thus water droplets 4. Collection – Rain/water consummates into ocean, sea, river 5. Water cycle – Water changes in state and forms ie. Gas, liquid, solid 6. Water temperature - Hot and cold water differentiation 7. Water transmission/movements from one location to another Others		

6.6 Findings

An overview of the children's performance for the pre-lesson (D1) and post-lesson (D2) drawings are first presented then followed by detail descriptions/evidence of factual and conceptual knowledge. Figure 6.2 describes the overall information mean score deduced with the coding checklist for pre- and post-lesson drawings.

Figure 6.2 An overview of the water cycle drawings pre-and post-lesson information mean score



Legend
Mean D1 – mean performance for pre-lesson drawing (D1)
Mean D2 – mean performance for post-lesson drawing (D2)

Table 6.2 Descriptive statistics of information mean score

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
MeanDrawing1	11	1	4	2.14	1.142
MeanDrawing 2	11	0	4	1.27	1.212
Valid N (listwise)	11				

The overall findings showed a negligible mean difference .87 (n.s.), with more information in pre-than post-lesson drawings thus, the teacher's lesson had little impact on the children's learning. The aim of having pre-lesson drawings was to establish a base-line understanding of the children's prior knowledge about the water cycle before teacher's teaching. It was then compared with the post-lesson drawings to examine any change in information and the teacher's lesson effectiveness in extending the children's learning.

6.6.1 Children's factual knowledge of the water cycle.

Factual knowledge of the water cycle refers to children's discrete and isolated knowledge of terminology of the elements (e.g. clouds, sun, rain), visually represented and/or verbally described by the child (Anderson & Krathwohl, 2001). Table 6.3 is a summary of the findings.

Table 6.3 Children's represented factual knowledge of the water cycle

THE WATER CYCLE	Pre-lesson D1		Verbal/visually represented	Post-lesson D2	
	% /no. of children	See sample figures		% /no. of children	See sample figures
Cloud to being	27% (3)	6.3;6.9;6.18	*"Clouds"*	18% (2)	6.4;6.19
Dark clouds	18% (2)	6.9;6.14	*"Dark clouds; is getting darker, darker"*	9% (1)	6.4
Rain / rain drops	45% (5)	6.3; 6.9; 6.11; 6.14; 6.18	*"That's rain;" "the rain"*	27% (3)	6.4, 6.6,6.19
Lightning	18% (2)	6.3,6.14	Visually represented	-	Not represented
Thunder	9% (1)	6.3	Visually represented	-	Not represented
Water collection e.g. river, sea	63% (7)	6.3;6.5;6.14; 6.18;6.22,	*"River;" "sea water"*	45% (5)	6.6,6.23,6.19
Sun	27% (3)	6.5,6.22	*Visually represented*	-	Not represented
Wind	-	Not represented	Not represented	-	Not represented
Landscape	55% (6)	6.3,6.5,6.14, 6.18,6.22	*"Rainbow;" "sun;" "stars;" "clouds"*	36% (4)	6.4,6.6, 6.19,6.23

**( ) raw number of children*

For the pre- and post-lesson drawings 55% (6) and 36% (4) children respectively showed discrete understanding of elements associated with the water cycle landscape e.g. "sun; clouds; rain; lightning; and thunder" - a context for rain fall (precipitation). Children's knowledge of water "collection" in *natural bodies* of water such as "river; sea; and ocean," for pre-lesson drawing was 63% (7) and post-lesson drawing 45% (5) respectively (see Figures 6.3, 6.5, 6.22, 6.18, 6.14), while 36% (4) for pre-and

post-drawings respectively represented collection of water in *man-made* receptacles – "toilet; bathtub; and swimming pool" (Figures 6.7, 6.9, 6.10, 6.11).

Figures 6.3 to 6.12 Pre-and post-lesson drawings by five children

Pre-lesson drawings (D1)	**Post-lesson drawings (D2)**

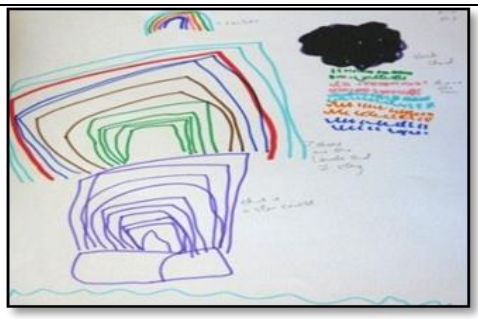
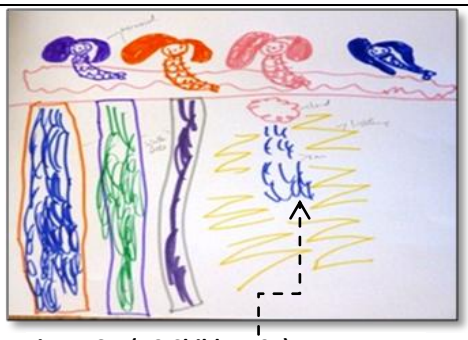

	

Figure 6.3 (D1 Child TM01) **Appendix F1** ***"Star cruise & rain"***	**Figure 6.4 (D2 Child TM01)** **Appendix F2** ***"Cloud; rain; lightning"***

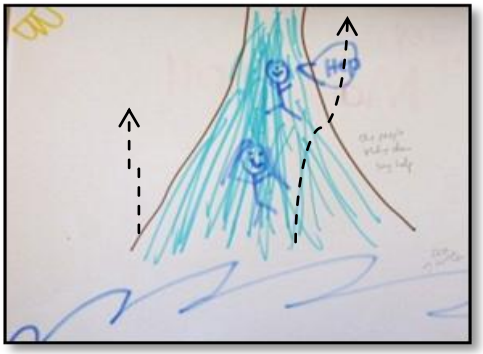



Figure 6.5 (D1 TM02) **Appendix F3** ***"Person call help drown in fountain water"***	**Figure 6.6 (D2 TM02)** **Appendix F4** ***"Cloud & raining"***

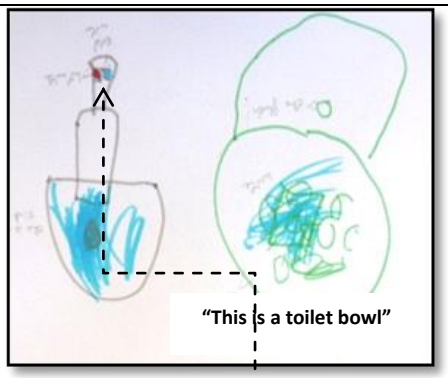


Figure 6.7 (D1 Child TM04)
Appendix F5
Colour coding of "hot & cold water"

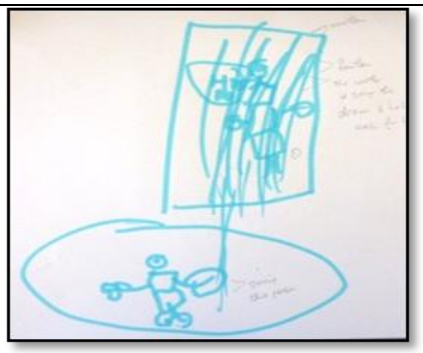


Figure 6.8 (D2 Child TM04) Appendix F6
"Going to drown; Saving this person"

Figure 6.9 (D1 Child TM06)
Appendix F7
"Rain drops come from cloud"
Collected in a swimming pool drawn with ripples

Figure 6.10 (D2 Child TM06)
Appendix F8
"She flushed; she didn't know that the poo poo is baby just flushed away."

Figure 6.11 (D1 Child TM08)
Appendix F9
"When the water falls in the drain it will go here."

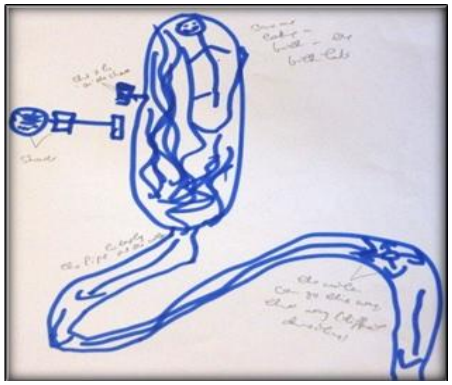
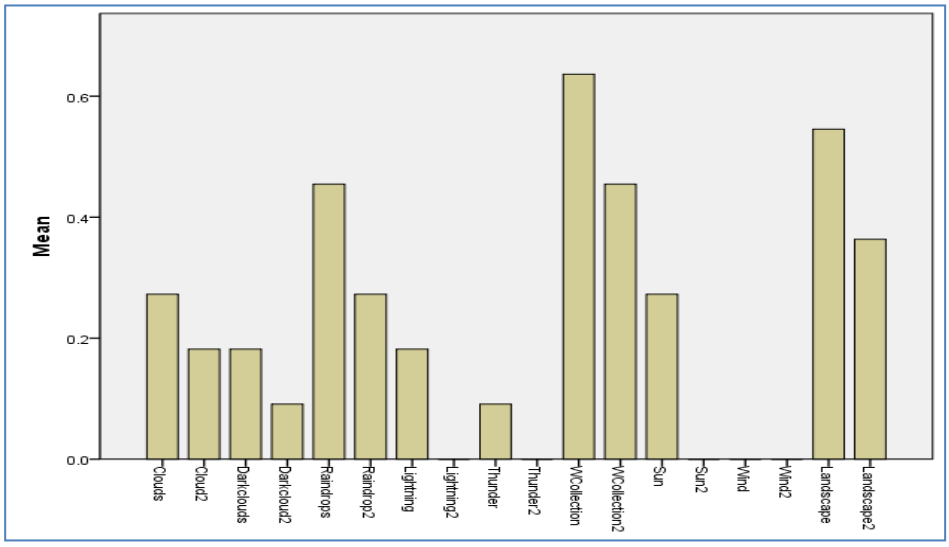


Figure 6.12 (D2 Child TM08)
Appendix F10
"The pipe to empty out the water."

The children could identify four dominant elements (factual knowledge): clouds; raindrops; water collection; and landscape for pre-and post-lesson drawings respectively. This is summarized graphically in Figure 6.13.

Figure 6.13 Factual knowledge: Common elements represented in pre-and post-lesson drawings



Legend
…2 – refers to post-lesson drawing (D2)
W - water

Table 6.4 Descriptive statistics of factual knowledge: Common elements represented in pre-and post-lesson drawings

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Clouds	11	0	1	.27	.467
Cloud2	11	0	1	.18	.405
Darkclouds	11	0	1	.18	.405
Darkcloud2	11	0	1	.09	.302
Raindrops	11	0	1	.45	.522
Raindrop2	11	0	1	.27	.467
Lightning	11	0	1	.18	.405
Lightning2	11	0	0	.00	.000
Thunder	11	0	1	.09	.302
Thunder2	11	0	0	.00	.000
Sun	11	0	1	.27	.467
Sun2	11	0	0	.00	.000
Wind	11	0	0	.00	.000
Wind2	11	0	0	.00	.000
WCollection	11	0	1	.64	.505
WCollection2	11	0	1	.45	.522
Landscape	11	0	1	.55	.522
Landscape2	11	0	1	.36	.505
Valid N (listwise)	11				

However, after the teacher's lesson there was an overall drop in the number of children representing these natural elements in their post-lesson drawings. Could it be due to shifts in thinking as Hall (2010) suggested "the meaning the children attached to their drawings is also opened to change with time and shifts in thinking [?]" ([ ] added, p.97), or there was little meaningful connections between what was taught and the children's more concrete experiences of bathrooms and toilets? The children seemed to stick by their prior-perceptions and interpretations because the teacher's teaching made little impact.

An unusual example was child TM11, presented an adequate representation of the water cycle in D1 (Figure 6.14) but for D2 (Figure 6.15) he confidently commented "*water comes from the sink* [pointing at the pipes]" set in the "*girl toilet"* and *"boy toilet*" environments which he had specifically indicated with arrows pointing at the social conventional gender-symbols. He even deliberately emphasized with long parallel lines, long water pipes transporting water to the sink. This was the only set of drawings out of 11 that showed contrasting perspectives (from correct to "incorrect") from a teacher's marking perspective. It is really a concern because children are presumed to learn from a teacher's teaching. Why the drastic shift in perceptions? What about the teacher's teaching? Was the child trying to explore different ideas of where water comes from?

Figure 6.14 (D1 child TM11)
Appendix F11
"That's rain; sea water; dark clouds & lightning"

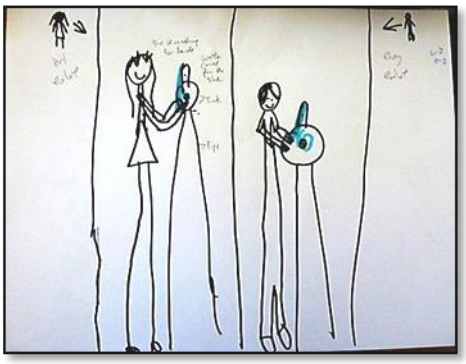


Figure 6.15 (D2 Child TM11)
Appendix F12
"Water comes from the sink"

6.6.2 Children's conceptual knowledge of the water cycle.

According to Anderson & Krathwohl (2001) conceptual knowledge is complex and organized. This section discusses coding checklist findings on the children's spontaneous concepts as well as matching it to the lesson procedures to continue the investigation of using drawings as potential sources of information to inform teachers' practices. The findings are summarized in Table 6.5 and Figure 6.16.

Table 6.5 Children's pre-and post-lesson conceptual knowledge of the water cycle

Conceptual knowledge	Verbal/visually represented	Pre-lesson drawing 1		Post-lesson drawing 2	
		% /No. of children	See sample figures	%/No of children	See sample figures
Precipitation – rain comes from the clouds	• *"Clouds are black"* • *"Rain from the clouds;" "got rain and lightning;"*	45% (5)	6.5; 6.11; 6.18; 6.14	27%(3)	6.6; 6.8; 6.19
Evaporation – the sun heats up/dries up water	Not represented	-		-	
Condensation – cold water thus water droplets	Not represented	-		-	
Collection – Rain/water consummates into ocean, sea, river	• Water flows into the sea, river; swimming pool	54% (6)	6.7; 6.22; 6.14; 6.18	36% (4)	6.8; 6.23 6.19
Water changes in state and forms ie. Gas, liquid, solid	Not represented	-		-	
Water transportation- movements from one location to another	• *"Ocean water; water goes into.." / falls in the drain* • *"Pipe to empty out"* • *"Water comes from the sink*"	27% (3)	6.20; 6.11; 6.15	27% (3)	6.12; 6.16; 6.14
Water temperature - Hot and cold water differentiation	• Washing basin - hot (red) and cold (blue) water • *"Rain made one feeling cold"* *"Warm, cold, hot water"*	18% (2)	6.7; 6.9	18% (2)	6.20

Figure 6.16 Summary of the children's pre-and post-lesson conceptual knowledge of the water cycle mapped to the teacher's lesson prcedures

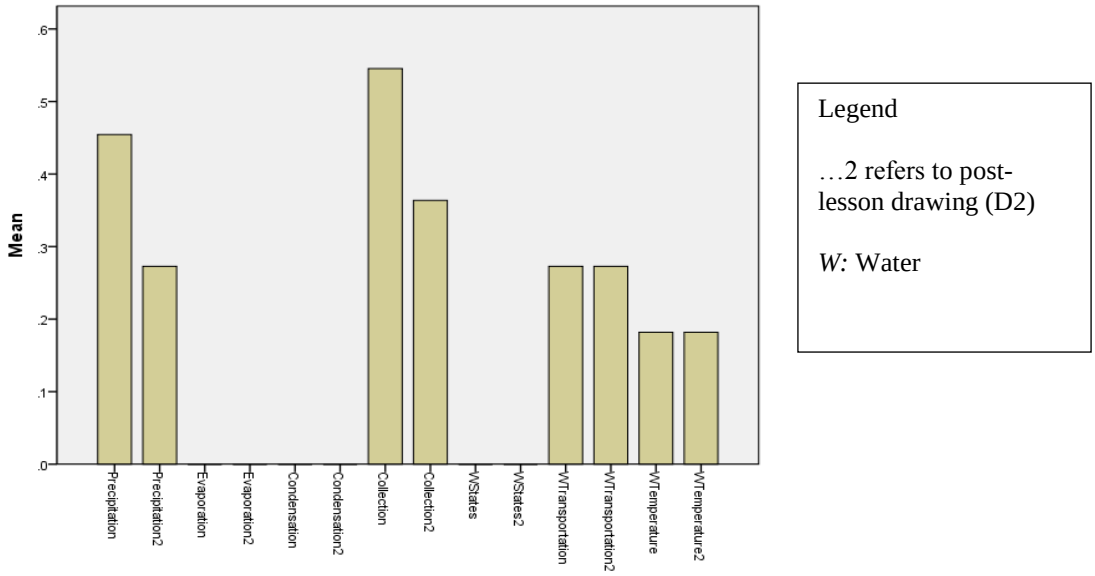


Table 6.6 Descriptive statistics children's pre-and post-lesson conceptual knowledge of the water cycle mapped to the teacher's lesson prcedures

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Precipitation	11	0	1	.45	.522
Precipitation2	11	0	1	.27	.467
Evaporation	11	0	0	.00	.000
Evaporation2	11	0	0	.00	.000
Condensation	11	0	0	.00	.000
Condensation2	11	0	0	.00	.000
Collection	11	0	1	.55	.522
Collection2	11	0	1	.36	.505
WStates	11	0	0	.00	.000
WStates2	11	0	0	.00	.000
WTransportation	11	0	1	.27	.467
WTransportation2	11	0	1	.27	.467
WTemperature	11	0	1	.18	.405
WTemperature2	11	0	1	.18	.405
WForces	11	0	1	.18	.405
WForces2	11	0	1	.09	.302
Valid N (listwise)	11				

Table 6.5 and Figure 6.16 summarized findings of 11 children's pre-and post-lesson conceptual knowledge of "precipitation" (.45 mean and .27 for D1& D2 respectively) and "collection" (.55 mean and .36 mean for D1& D2 respectively). In contrast, "evaporation" and "condensation" were not represented at all in the pre-and

post-lesson drawings. Instead the children showed consistent schematic interests in "water transportation," water moving from one point to another mainly via water pipes at .27 mean. While "water temperature" .18 mean (hot, warm and cold water; or colour coded conventionally as "red" [hot] and "blue" [cold]) water respectively in the pre-and post-lesson drawings.

Hein and Price (1994) suggested that children did not acquire ideas or facts in a vacuum. They are assimilated into existing intellectual and social frameworks. The next section, discusses children's unique conceptual knowledge found in their intellectual and social frameworks outside of the lesson. These ideas were water related, although not specific to the water cycle such as "water danger;" "water sources;" "water utilities;" and "water transportation" and children's acquired social conventional symbols to represent "water temperatures" mentioned earlier.

Figure 6.17 Children's pre-lesson drawings presented unique conceptual knowledge outside of the lesson

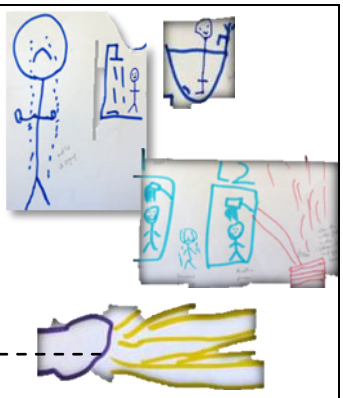
Child drew by interpretating, classifying and/or inferring	Characteristic descriptions &/ or visually represented	No. of children	Drawing evidence
Water danger	*"Drown shouted help"* *"Wash away…"*	3	
Water colour coding of red and blue • Hot/cold water tap differentiations • Child's ability to read and decode environmental signs for daily functions	Drawing: red/blue for hot and cold water tap	1	

Water sources / Water transportation/ Water utilities

- From shower / bathtub / sink / toilet
- Drainage pipes
- Human tears
- Rain, ocean, sea

Analogy of flowing water from the shower head to tears streaming downwards

3



A water pipe underneath the ocean that drained water away

The findings showed children's spontaneous concepts were uniquely personal and egocentric, stemming from daily encounters of water as rain; water in the shower and toilet; swimming pool water, water slide, and news media coverage of the Sumatra - Indonesia 2010 tsunami. The children also associated water with events such as drowning and people rescue effort; mermaids on rocks, and observed phenomena of rainstorms (lightning, thunder and dark clouds) in Singapore. The pre-lesson drawings presented two dominant ideas: water transportation/movements and water danger/rescue effort. Children's understanding of water transportation embraced ideas of water utilities for daily usage determining where water comes from and where it flows - via outlets such as the shower head, toilet bowl, and faucet for hand-washing (see Figures 6.18; 6.20; 6.22).

Pre-lesson drawings (D1)	Post-lesson drawings (D2)
	
Figure 16.18 (D1 Child TM10) Appendix F13 "Ocean water go into the drain"	**Figure 6.19 (D2 Child TM10) Appendix F14 *"Water all flow into the drain"***

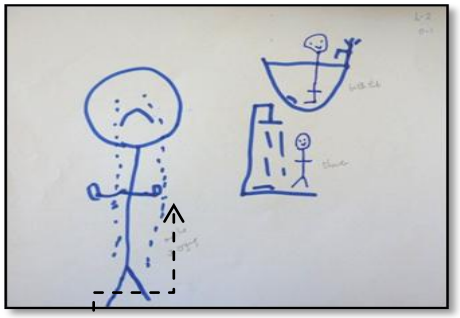


Figure 6.20 (D1 Child TM07)
Appendix F15
***"He is crying;"* shower; bathtub**

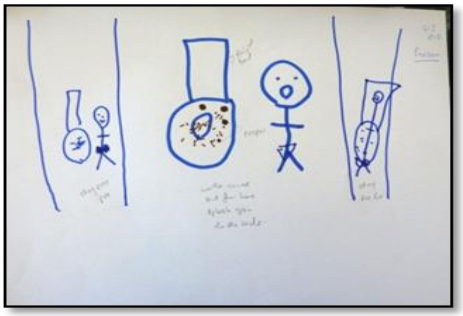


Figure 6.21 (D2 Child TM07)
Appendix F16
"Water comes out from here splash go in to the circle."

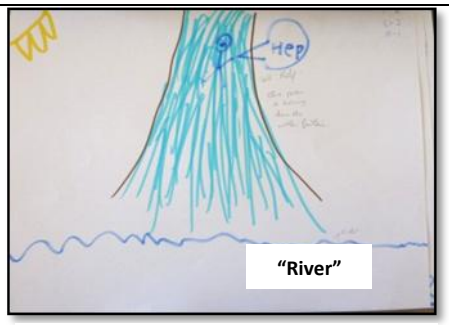


Figure 6.22 (D1 Child TM05)
Appendix F17
"Call 'Help' This person is swimming down the water fountain."

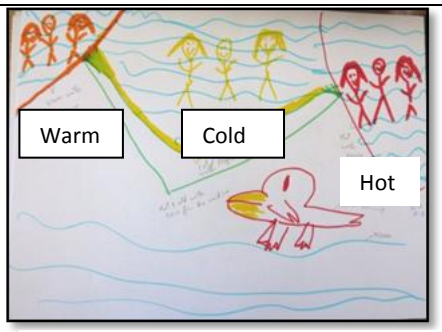
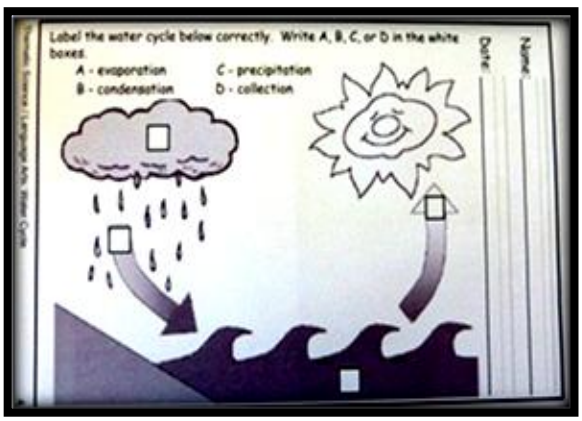


Figure 6.23 (D2 Child TM05)
Appendix F18
"Hot & cold water come from the machine"

The teacher's lesson included power point slides of "Drippy the raindrop" a story to teach the water cycle concepts. She reviewed the story by getting children to sequence picture cards and word labels of the water cycle's four stages to check for understanding. Thereafter, the children were given a worksheet to identify the stages by filling in the boxes *A* (evaporation); *B* (condensation); *C* (precipitation); and *D* (collection) (Figure 6.24).

Figure 6.24 The water cycle worksheet (Appendix F19)



The class teacher reported 90% children completed the worksheet correctly. On the contrary, the post-lesson drawings findings presented a different story. They showed children's naïve understanding of "precipitation and collection" but little understanding of "condensation and evaporation." The children appeared able to differentiate between the degree of free expression expected of a worksheet and making a drawing. They regurgitated text-book answers for the worksheet while still holding on to their personal experiences and perceptions of where water comes from in their drawings. (Future research could investigate children's perceived notion of worksheets versus drawings).

The following discusses the various themes that children spontaneously explored in their post-lesson drawings outside of teacher's teaching. Each theme is discussed and supported with evidence illustrated from Figures 6.25 to 6.29.

Figure 6.25 Children's post-lesson drawings explored concepts of "water behaviors"

Conceptual knowledge	Verbal/visually represented	No. of children	Figures
Water behaviour **(Linguistic implication – adjectives to describe water behaviour in various contexts)** • *Cascading* waterfall • *Pouring* rain • *Falling* rain • *Whirling* water in toilet bowl	*"Waterfall"* (cascading) *"Raining"* (pouring/falling) *"Water comes out from here splash go in to the circle"; "She flushed"* (whirling) *"The pipe to empty out the water; the water can go this way, that way"* (flowing)	**3**	 Cascading 2.14   Whirling water in a toilet bowl

Figure 6.25 shows at least three out of 11 children's schematic interests in "water behaviour," water movements in various ways (e.g. *cascading; pouring; falling; flowing* and *whirling* water in a toilet bowl). It also showed children's implicit concepts of water "collection" but from a viewpoint of water resultant movements.

Perhaps, this is a theme worth exploring for potential curricular ideas because these are action-oriented and children want to know the "how" and "what" makes things move/function observed in the environment.

Figure 6.26 Children's post-lesson drawings explored concepts of water activities

Spontaneous conceptual knowledge	Verbal/visually represented	No. of children	Figures
Water activities • Sailing, cruise • Jacuzzi of cold, warm & hot water	*"They sit the boat & is raining"*	2	 Sailing
	"Warm, cold, and hot water people swimming"		 A Jacuzzi divided into cold warm & hot

Figure 6.26 shows two children were interested in exploring ideas of water activities "*sailing*" and "*Jacuzzi*" respectively. A child interpreted water temperatures as "*cold, warm* and *hot*" in a Jacuzzi instead of the teacher's scientific explanations of water temperatures as "solid, liquid and gas" states in her first lesson. Again, it shows the principle of how children think and learn – from a personal (experience) standpoint to general.

Figure 6.27 A child's post-lesson drawing explored concepts of the "Flavour sea"

Spontaneous conceptual knowledge	Verbal /visually represented	No. of children	Figure
"The Flavour Sea" *(Child proudly declared)* • Different fruit flavored-water, chocolate, strawberry, apple	"*The flavor sea come from the rain; Water has different flavors-apple, strawberry, chocolate, grape"*	1	 **See Appendix F22**

The girl commented "*the flavour sea comes from the rain*" showing conceptual understanding of "precipitation and collection." But she interpreted as the flavour sea of different fruits and colours that she matched enthusiastically. She also explored ideas of water temperatures "*cold water becomes hot*" and colour coded it "blue" (for *cold* water) and "red" (for *hot* water). She was considering water from a sensory perspective of tastes, smells and colours. It was a unique idea, most probably stemming from her personal experience of drinking fruit juices but translated it into a collection of water, the "flavour sea." Perhaps, the teacher could extend the girl's idea with a science experiment by using coloured water (e.g. blue) and a white carnation flower or celery stick to show how water travels from the container and turning the white carnation flower/celery stick blue to match the scientific idea of phases of change/movement (Newton, 2012).

Figure 6.28 Children's post-lesson drawings explored concepts of the sources of water; water transportation and water utilities

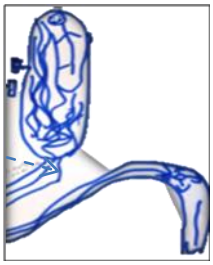
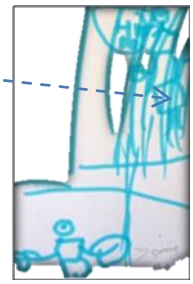
Spontaneous conceptual knowledge	Verbal /visually represented	No. of children	Figures
Water sources **Water transportation** **Water utilities** • From machine that generate warm, cold, hot water. • Piping system	*"Hot & cold water come from the machine"* *"Water come from the sink through pipes"* *Water all goes into the drain Piping*	4	  

Figure 6.28 shows four children still drew on their prior experiences of daily showers and toiletings to locate where water comes from: from a machine that generates hot and cold water; water comes from the sink; and carried along by water pipes. Perhaps, the children could not quite figure out how water in the atmosphere could move from ocean to the clouds then fall as rain without a visible structure to "carry water" from one point to another. Newton, (2012) suggested "having a particular view of the world shapes the relationships we are likely to infer" (p. 61). These children's particular view of water is that water is carried/moved via water pipes, thus it shaped how they inferred relationships between the water cycle.

Newton (2012) pointed out "understanding is perspective-bound" (p.61) and these drawings presented information that children learn and think through perspective bound-analogies (water cycle phases of change is matched to water

transported via water pipes). According to Newton, (2012) analogies, when used appropriately and in the right context, can be powerful devices to support and change perspective to enable new understandings. This research suggests that if teaching for understanding, teachers ought to consider teaching from children's generated analogy (e.g. water pipes) to bridge the gap from concrete to abstract (Newton, 2012).

Figure 6.29 One child's post-lesson drawing explored concepts of "water danger"

Spontaneous conceptual knowledge	Verbal /visually represented	No. of children	Figures
Water danger • Fountain/drown and rescue	*"The water is going to drown & he ask for help"*	1	

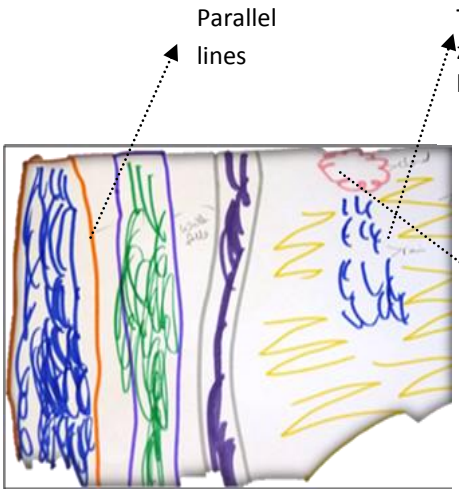
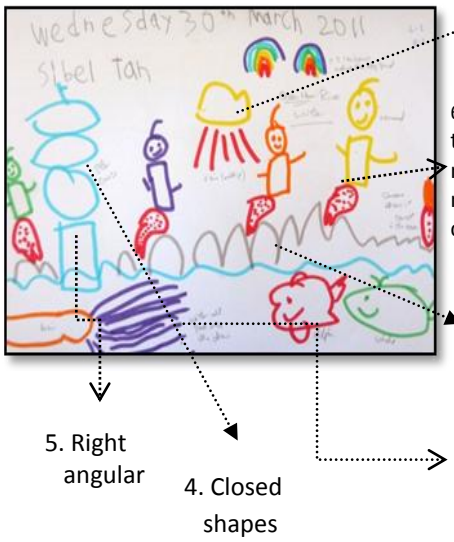
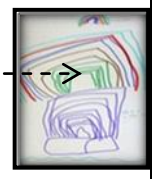
The notion of water and its potential danger seemed to appeal to the children (Figure 6.29). Three children and one child in pre- and post-lesson drawings respectively explored the idea. Could it be the children perceived the water cycle as a phenomenon taking place in the ocean? They associated it with the natural forces of elements and, incidentally, the tsunami in Indonesia reported in the news media. This is a possible curricular idea the class teacher could integrate in her subsequent third lesson on "water pressure" to address children's concerns.

Figures 6.25 to 6.29 presented children's spontaneous ideas of what water meant to them from personal standpoints. These ideas may not seem relevant to the water cycle theme from a teacher's perspective but offered significant information of conceptual structures operating in the children's mind shaping learning for understanding (Newton, 2012). This will be followed up in the discussion section. Meanwhile, it is pertinent to report findings of marking (graphic) structures and strategies the children used to capture ideas of the water cycle indicative of children's thinking and learning.

6.6.3 Children's representational strategies and marking structures used to compose drawings of the water cycle.

Figure 6.30 illustrates the graphic/iconic marking structures children employed to represent the water cycle ideas. Drawing challenges children to select from a repertoire of drawing strategies and structures that best capture their cognitive intention; this applies in verbal communication too. Many researchers suggest marking/line-structures and strategies chosen suggest a child's development in visual perspectives and mental operations. Matthews's (1999) model of generation structures is the interpretative framework to discuss the visual syntax used (see Chapter 2). Basically, there are two modes of representations children employ to record information visually. "Configurative" representation referred to the representation of shapes of objects per se, observed in the environment e.g. car, trees, apples. "Dynamic" representation, also known as "action" representation, where the child is interested in the actions, tracing trajectory movements through space and time such as cascading waterfall or raining represented with push pull actions creating push pull line-markings (see Figures 6.4 and 6.8).

Figure 6.30 Common marking structures used to construct meanings of the water cycle

Characteristic line structures	Conceptual Significance
	1. Matthews' second generation structures 2. The distinctive choice of line structures revealed the child's conceptual understanding: **Configurative representation** • Form/state of objects e.g. cloud is soft, fuzzy and the child used travelling loops to capture its roundedness contrasting the sharp edges of lightnings in travelling zig zags which was a conventional representation used in media too **Dynamic representation** • Parallel lines revealed concepts of the verticality and elongatedness of a waterfall. • Push pulls and vertical arcs to represent cascading water.
	**Configurative representation:** The children utilised these common line structures (4) to capture objects such as cruise ship, mermaids resting on rocks (2) and rain clouds (1). Analogical thinking was evident, triggered off by visual feedback of line structures e.g. Mermaid's tail was mapped to a carrot (6); u-shaped rainbow lines were mapped to a multi-levels cruise liner 

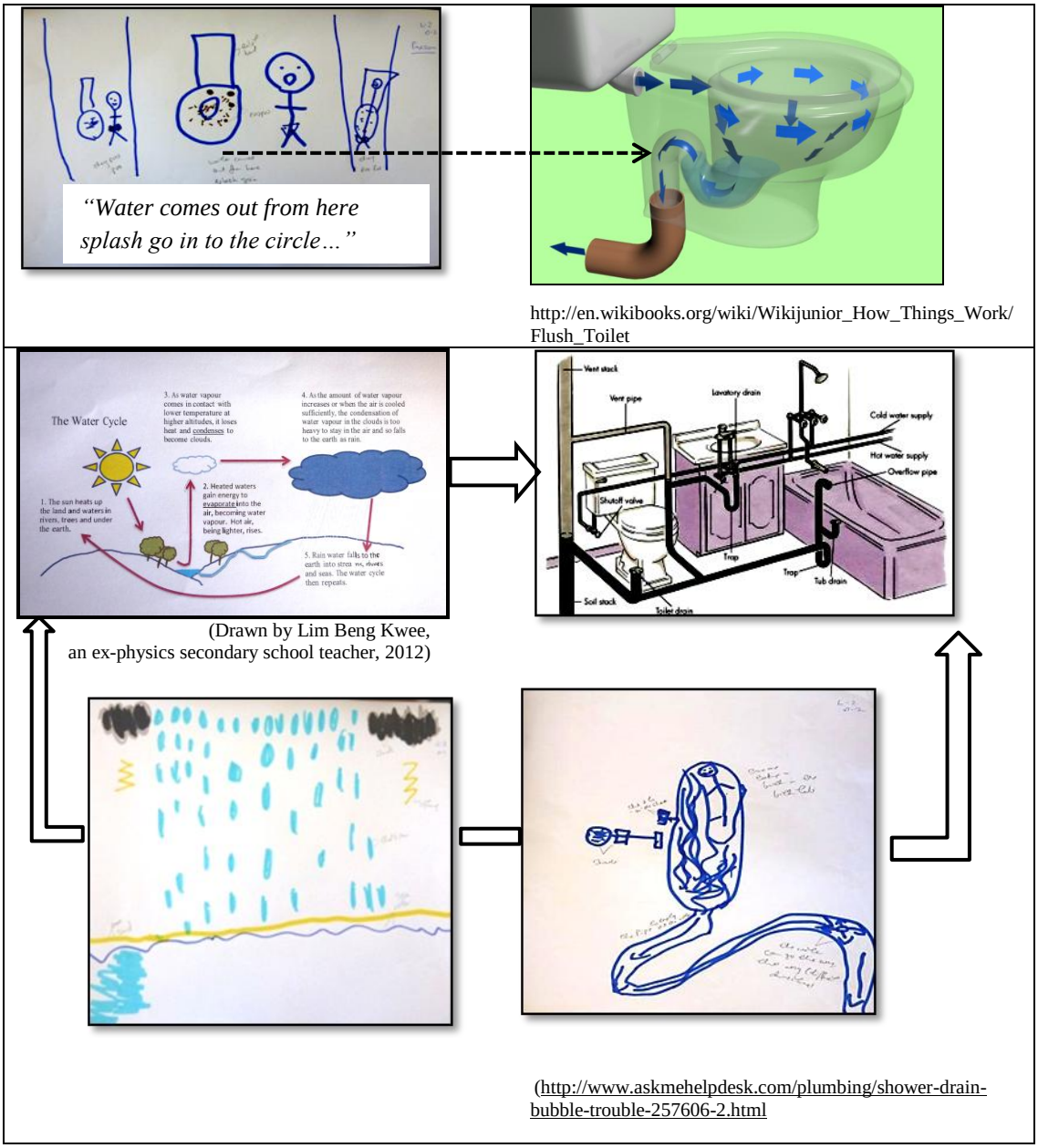
6.7 Discussion

What evidence of learning was demonstrated in the 22 pre-and post-lesson drawings that could inform teachers' practices? Coding checklist findings clearly showed the children could identify only two out of four water cycle stages, "precipitation and collection" but not "evaporation and condensation," stipulated in the teacher's lesson objectives nor her reported 90% children who did the worksheet correctly. Could it be the children lacked the necessary drawing skills to represent abstract concepts of the water cycle? Or have they yet to master Newton's (1985) notion of symbolic metaphors (arrows or moving lines) to represent abstract ideas to show evaporation? Perhaps, the children simply drew what they like to draw best and knew how to draw. These were probable views but not conclusive. Figure 6.12 showed one boy was able to use metaphor of arrows to indicate the different directional flow of water through a drainage pipe, and Figure 6.15 the boy drew arrows to direct our attention to the girl and boy toilets' signage. Two other children used conventional travelling zig-zag lines to capture obscure flashes of lightning (see Figures 6.4 and 6.14). Studies have shown, sometimes what children could not represent in drawing they find a way of getting around by using verbal explanations or gestures of pointing and acting it out or copying from friends or seeking an adult's or friend's help (Jolley, 2009; Hope, 2008; Athey, 2007; Matthews, 1999). Moreover, Piaget found young children have a reason and an explanation to everything even if it was illogical to an adult. In other words, it shows children are quite persistent in solving a problem or getting around a difficulty. There were children who got around the problem of representing ephemeral states with verbal explanations: "*the man is going to let the river wash away he flew away*," to explain away concepts of "force" and "power" that he could not represent. Another child (TM06) explained *"is getting darker and darker"* (Figure 6.9) to indicate notions of time-based concept of transitions from dark to darker states. Perhaps, such a process could be better captured with the Bloom's TEO to illuminate children's mental activity.

Findings suggested the children inferred analogous water movements of the water cycle with water channeled through pipes (Figure 6.10). They seemed to characterize water cycles by emphasizing water moving from one point to another (Figure 6.18). The children interpreted the water cycle in two modes: natural water

cycle (see Figures 6.3 & 6.4; 6.6; 6.9, 6.14) versus man-made water "cycle" channelled through water pipes (see Figures 6.7; 6.11 & 6.12; 6.15; 6.20 & 6.21).

Figure 6.31 Children's analogous perceptions of man-made "cycle" and the water cycle

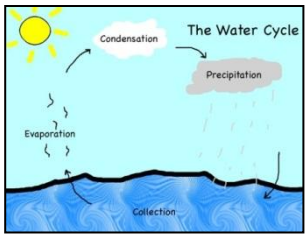


Bar's (1989) study of Israeli children's views about the water cycle (5 to 15 years old) found similar pattern of "children's first ideas about the phenomena of clouds and rain are related to man-made equipment or to God" (p.494), a development from a "concrete to a more abstract form" (p.494). How does water travel in the atmosphere? The children resolved by employing analogies of water

pipes to put their naïve understanding across in drawing. Russell and Watt (1990) found a strong link between young children's idea of *leakage, drainage and water pipe* in the study they conducted on the water cycle. They concluded that "very little understanding of the process behind the cycle until children have reached the age of ten or eleven, and even then, only limited number of children" (p. 46). The children in this study exhibited Collis and Biggs (1982) notions of "multi-structural" or "relational" knowledge by making simple and obvious connections of clouds, rain, lightning and water collection but the full significance of the water cycle was not fully grasped.

Figure 6.32 presents children's diverse ideas of where water came from; a possible starting point for teaching. The drawings showed evidence of children's constant thinking shifts concerning the possible sources of water supply. They vacillated between ocean and sea (see Figures 6.5 & 6.6); swimming pool and toilet (Figures 6.9 & 6.10); shower and toilet (Figures 6.20 & 6.21); and sea and washing basin (Figures 6.14 & 6.15).

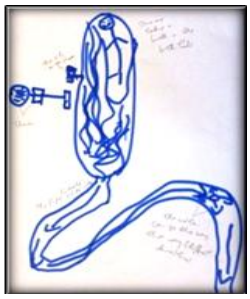
Figure 6.32 Children's diverse concepts of where water come from



(D1 Child TM11)
"Rain is collected into sea (water)"

(D1 Child TM08)
"When water falls in the drain it will go here"

D1 ChildTM07
"He is crying; he is showering"
Did the child see structural/perceptual analogy between water trickling from the eyes and the shower-head?



(D2 Child TM08)
"The pipe to empty out the water; water can go this way, that way".

(D1 Child TM 10)
"Water goes in the drain"

Perhaps, there is a point to note for teaching concepts of the water cycle. The first thing is to clarify by considering from children's perspectives (e.g. sources of water – water from the clouds (rain) or as a child had depicted water from the eyes as tears [see Figure 6.20] and from shower as treated water). If the teacher had consulted the children's prior knowledge she could then meet the children's misconceptions or partial conceptions head-on. Newton (2012) proposed "check the student's prior knowledge of the topic to determine if support for understanding is needed" (p. 62). The findings obviously show the teacher taught without checking the children's prior knowledge thus, her lesson's impact was negligible. In component I the 325 surveyed Singapore teacher-respondents had cited Question and Answer; children observation; and communication as means to discover children's prior knowledge but this study suggests that perhaps, the teachers needed help with an alternate strategy? So far, the findings showed using drawings to evaluate children's learning presented information of children's thinking and learning by analogical reasoning (Figures 6.30 and 6.31). Perhaps, Singapore teachers need to be taught how to read drawings to take on children's prior and spontaneous knowledge as meaningful starting points for teaching.

The focus of the study is how best to use ideas deduced from children's drawings to inform teachers' practices. In the early years classroom, every individual child matters because children learn from one another (Qualter, 1996) even though some spontaneous ideas illustrated may be expressed by different individual children but all contribute to the success of learning and teaching for best practices. Qualter's (1996) notion of every individual child matters because children's interests are not unfounded. Instead they are rooted in:

- "the interest an individual child has in the topic,"
- "the child sees that activity [theme] as relevant to him or her," and,
- "what the child knows and understands already." (p.45)

Figure 6.33 & 6.34 Child (TM09) pre-and post-lesson mathematical concepts integrated with the water cycle

Figure 6.33(D1 Child TM09)
Appendix F20
Mathematical concepts "length"

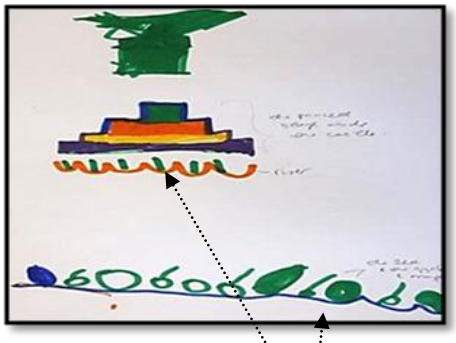


Figure 6.34 (D2 Child TM09)
Appendix F21
Mathematical concepts of "length"

For example, child (TM09) demonstrated a particular idea related to mathematical concepts - the measurement of length, and part-and-whole relationship. In Figure 6.33 the child drew a continuous blue wavy line and repeated figure 8-like for fishes across the paper. A variation of this was repeated in her post-lesson drawing (Figure 6.34). She drew a blue line (for sea) with apples and oranges floating on it. Next, she drew an orange wavy line (for river) measured by the length of a castle sitting above it. Worthington and Carruthers (2003) suggested it is drawing of "mathematical mark-making, help bridge the gap between informal and formal mathematics" (p. 52). Informal mathematics referred to non-standard measurements (e.g. ice-cream sticks or paper clips) to measure the lengths and heights of something. It also helps children to develop part-whole concept. The child showed consistent schematic interests of this aspect in both drawings. It appeared irrelevant to the water cycle theme but Copple and Bredekamp, (2009) suggested children learned in an integrated manner; they do not compartmentalised subject matter. As such children's drawings when taken seriously provide teachers with insight into another principle; "children learn in an integrated manner."

There were evidential findings of analogical reasoning from the drawings (Goswami, 1998). They illuminated two levels of analogical thinking:

- Conceptual level or conceptual analogy: where children matched mental concepts drawn from daily experiences (e.g. water moving through water

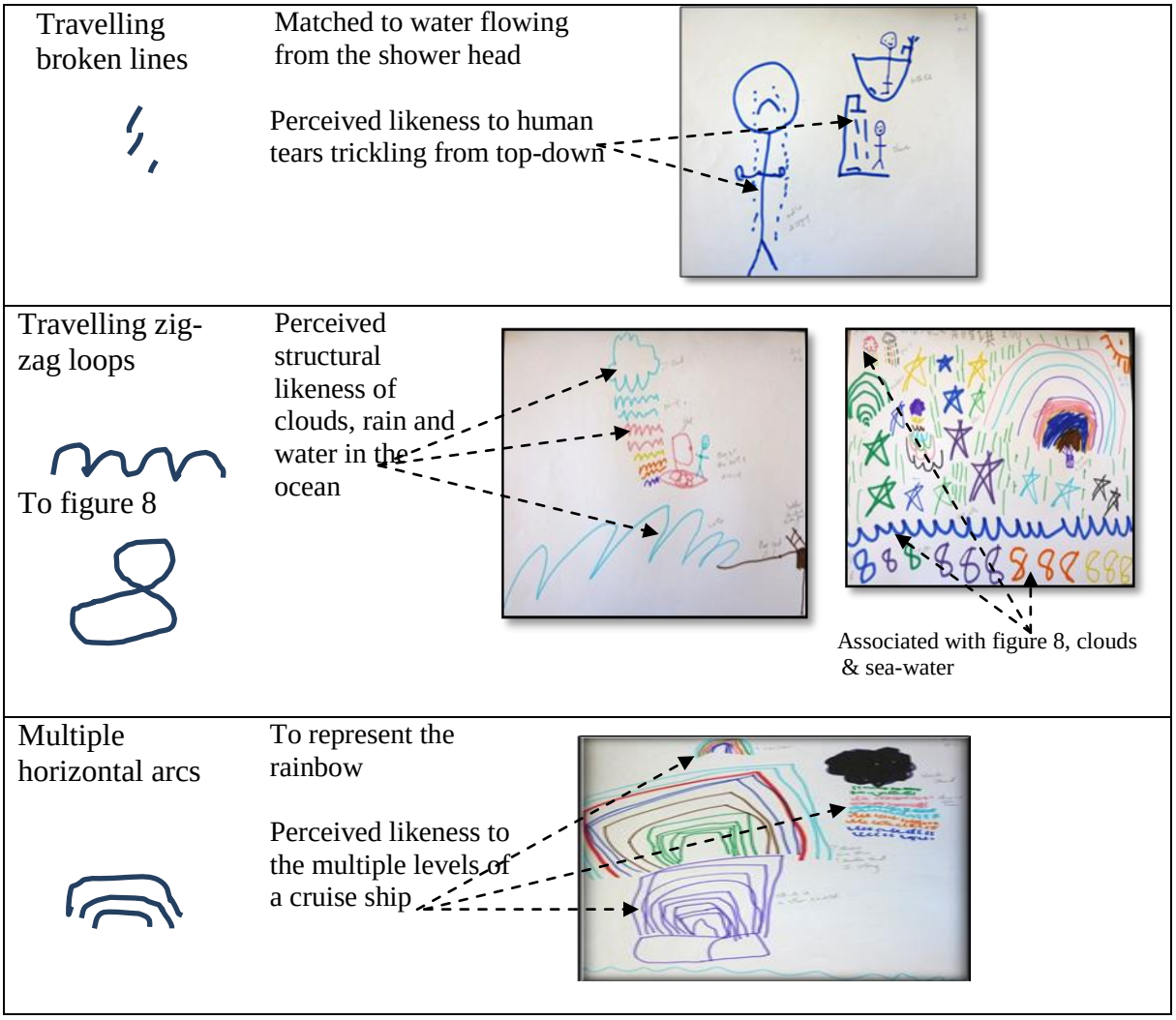
pipes to water moving at atmospheric level (Figures 6.9 & 6.10; 6.13 & 6.14).

- Structural level or perceptual analogy: where the child perceived similar visual-likeness of forms and structures that prompted them to associate with something similar in form and visual likeness.

6.7.1 Examples of perceptual analogies in children's drawings.

Figure 6.35 summarized some perceptual analogies the children devised in their drawings. There was evidence of children perceived structural or perceptual analogies of visual-likeness in forms and structures that reminded them of other things of similar visual-likeness.

Figure 6.35 Perceptual analogies the children devised in their drawings



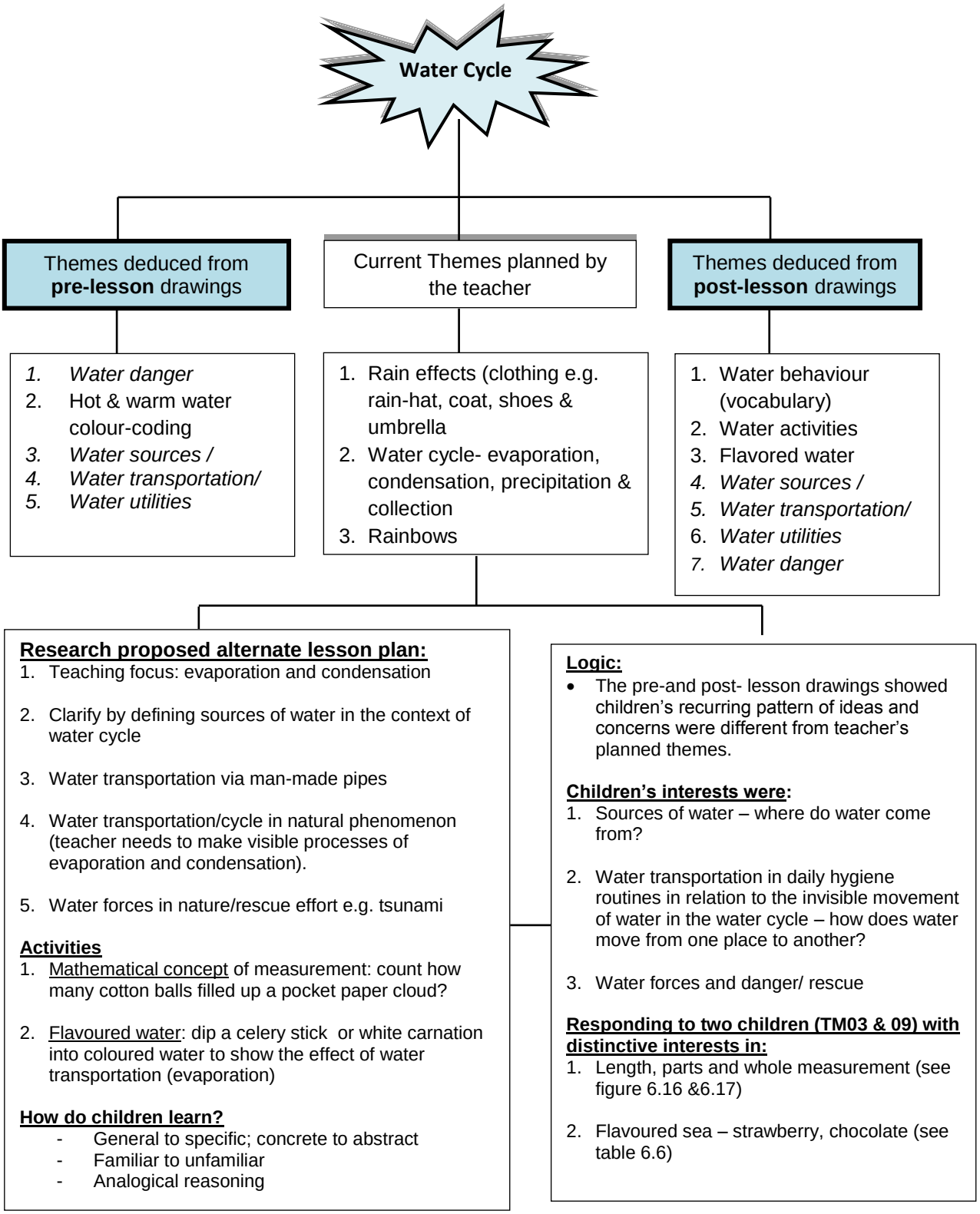
Triangular form

Mapping spotted triangular mermaid's tail to that of a carrot

Athey's (2007) developmental studies of children's drawings, also found children making links between general graphic schemas and letter forms by drawing triangular forms for skirts and capes to writing of upper-case "A" and "M," supported by evidence found in Eng (1959). Athey (2007) proposed that to see "commonalities required attention to form rather than content" (p.170). In other words, while drawing a child experiences constant shift of attention between forms (line structures and symbols) and content-meanings with each mark and thought visually emerging before them. The child is busy "transferring knowledge from one to the other" (Keane, 1988 cited in Goswami, 1998, p.64). Goswami (1998) observed image schemas are analogical representations involving active abstraction of key information then recoded into a non-perceptual or visual form that represents a meaning. She believed analogical reasoning characterizes a higher-order form of thinking about relations found only in human cognitive learning. The study of analogical reasoning in particular, perceptual analogy in children's drawings deserves more research attention.

Children's perception of encoding information in worksheets versus drawing is another area worthy of future research. Was it a case of "worksheet smart versus what I really think?" Why, would a child identify the stages correctly on a worksheet but gave alternative views in drawings? Are structured worksheets a reliable source of assessment? Lastly, informed by the findings, the study suggests concept map as a teaching strategy to identify and bridge gaps of understanding (Newton, 2012 - See Figure 6.36).

Figure 6.36 Concept map as a teaching strategy for the water cycle



The concept map illustrates how information deduced from the children's drawings is used to inform teachers' practices. It helps teachers to plan lessons, catering to the individual and group needs by integrating children's prior/spontaneous knowledge indicated as pre-and post-lesson "drawing deduced themes" and suggested follow-up activities. Teacher's "current planned themes" are themes already predetermined as part of the kindergarten curriculum. It shows contrasting topics of interests from teacher's and children's perspectives. The children seemed to be more drawn towards dynamic and exploratory areas such as water and its danger; how water is collected and transported; and the various sources of where water comes from. They did not reflect the teacher's idea of "rain coats, shoes and umbrella" and not even a "rainbow" yet because the children have yet to figure out what the water cycle is all about. Perhaps, the teacher has to seriously consider facilitating meaningful learning informed by the children's spontaneous knowledge. In addition, by learning from children's drawings and viewpoints, this contributes to teacher's professional growth and fresh ideas for the curriculum.

6.8 Conclusion

The children's water cycle drawings evaluated with coding checklist, provided information of factual and conceptual knowledge indicating achievement mapped to the teacher's lesson outcomes. It presented information of the conditions and processes of how children learn (e.g. familiar to unfamiliar; concrete to abstract; and integrated learning). The drawings also evidently demonstrated analogical reasoning at conceptual and perceptual levels supported by studies of literacy in writing and drawing. Certainly, the children's schematic pattern of interests were identified and recognized in the drawings but not cognitive processes. However, so far, the study has demonstrated children's drawings are a potential resource of curricular ideas teachers can use for lesson planning to teach for understanding by connecting with what children already know from children's standpoint.

Chapter 7 Research Component III – Bloom's Taxonomy of Educational Objectives (TEO -cognitive processes) Children's Drawing Evaluation Checklist Methodology, Findings and Discussion on Wild Animals and the Water Cycle Drawings

7.1 Introduction

To establish a logical connection between chapters 4, 5, 6 and 7, it is appropriate at this point, to review the conceptual issue of finding evidence of information in children's drawings. Basically, evidence of information referred to children's prior knowledge (Drawing1) or change in knowledge (Drawing 2) involving children's spontaneous concepts that stemmed from their individual interpretation, exploration and generalization outside of the lesson and/or cognitive processes that could inform teachers' practices and lesson effectiveness. This chapter, the next stage of the study attempts to investigate teachers' lesson effectiveness in extending the children's learning and how well those concepts were applied in the children's drawings evaluated with the Bloom's taxonomy of educational objectives (TEO) drawing evaluation checklist adapted and supplemented with examples drawn from the investigator's many years of observing some form of thinking activities induced by drawing. Biggs and Collis (1982) stated,

> *Analysing the responses of any particular student will usually make it quite clear how well that concept has been applied, and by implication whether or not it should be retaught* (p.175).

Thus far, the children's responses analysed through their drawings in chapters 5 and 6 showed both teachers' lessons on wild animals and the water cycle by implication needs to be "retaught" because they did not design their teaching to fit what the children already know (Biggs & Collis, 1982). On the other hand, lesson's effectiveness is also influenced by a teacher's philosophy and beliefs about teaching and learning that shape his/her instructional practices (Bolden & Newton, 2009). Component I findings (Chapter 4) showed Singapore teachers' teaching decisions were primarily influenced by their philosophy and beliefs about teaching and learning (e.g. prior knowledge is important to children's learning; and equal learning opportunity for all). Harlen (2006) concurred that a teacher's definition of learning had implications for how they supported children's learning, the teacher's lesson planning, classroom teaching and assessment. Evidence of learning in this study encompasses Harlen's (2006) three dominant views regarding what could be learned:

1. Adding more knowledge and skills as a result of being taught;
2. Making sense of new experience by the learners themselves; and
3. Making sense of new experience by learners in collaboration with others. (p.3)

Pertinent to the study is learning view (1) whether the teachers' lessons had added more knowledge of wild animals or the water cycle or thinking skills to the children as a result of being taught. Therefore, component III measures children's pre- and post-lesson content-knowledge with Bloom's TEO. The aim was to find out whether it was a case of a lack of adequate lesson designed to fit what the children already know from six cognitive processes perspective as well as to investigate what type of information could be captured with Bloom's TEO in contrast to an information coding checklist (see Chapters 5 and 6). Component III's research hypothesis was - if the 140 teacher-respondents could elicit evidence of content-knowledge and thinking processes with the Bloom's TEO then most probably it has the potential as a drawing evaluation checklist tool to help teachers to read information to inform teachers' practices.

This chapter discusses the findings of 140 pre-and in-service teachers who had randomly rated pre- (Drawing1) and post-lesson drawings (Drawing 2) with Bloom's TEO (see Appendix A1).

7.2 Research Component III Aims

To investigate whether the Bloom's TEO had the potential to be used as a "children's drawing evaluation framework" to help teachers to read evidence of learning to inform teaching practices in planning lesson objectives, lesson activities, and assessment. It also aimed to address the following issues:

1. Do other teachers read information in children's drawings relative to chapters 5 and 6?
2. Could the Bloom's TEO help teachers unfamiliar to the reading of children's drawings find evidence of learning?
3. What are the pros and cons to read drawings with the Bloom's TEO?
4. Why read children's drawings with the Bloom's TEO, when a simple coding checklist aligned with lesson's objectives could identify evidence of learning?

7.3 Methodology

A pilot study was carried out with 45 pre-service teachers. The teachers had to rate from a scale of 1 to 5 (least to most evidence of information) with pictures of pre- and post-lesson drawings juxtaposed within one checklist (see Appendix G). A rating scale was chosen because it allowed the respondents to quantify the quality of drawing ideas encoded by assigning an appropriate value in order to calculate the difference between Drawing 1 and 2. This was done with an understanding that there are limitations to rating scales such as inadequate precision and inconsistency in respondents' responses resulting in random rating. But these aspects were in some measure addressed later by having multiple respondents of 140 by obtaining the average responses and deducing the general recurring pattern. Another concern with

the piloted checklist was the respondents' expectation-effect that post-lesson drawings done after a teacher's teaching may be better than the pre-lesson drawing. For that reason, the investigator made the following modifications:

- Drawings were given codes known only to the investigator, in particular, information of whether the drawing was a pre- or post-lesson one.
- Only *one* picture of either pre- *or* post-lesson drawing was enclosed in the Bloom's TEO checklist (see Appendix A1).
- The rating scale was modified to 0 for no evidence instead of "NIL;" 1 for least evidence in quantity (countable number of ideas e.g. one or two items) and quality (significance and meaning of the idea e.g. uniqueness of idea expressed), and 5 for most evidence in quantity and quality accordingly.

7.4 Sampling Procedures/Participants' Characteristics

The 140 Bloom's TEO teacher-respondents were found in naturally occurring clusters in an early childhood teacher training institutes centrally located in Singapore. The teachers were pre- and in-service teachers pursuing Bachelor studies in Early childhood education or a diploma in education, respectively. The teacher-respondents were 23 % Malay, 69% Chinese and 9% Indians. They range from 19 to 55 years old from diverse cultural and socio-economic backgrounds (see Chapter 3).

7.5 Measurement

The Bloom's TEO has six criteria – Remember; Understand (sub-criteria included interpret, classify, and infer), Apply; Analyze; Evaluate and Create. Each criterion had at least 3 sub-itemised criteria except for "understand" with nine sub-itemized criteria (see Appendix A1). Examples relevant to children's drawings were given to guide participant's understanding of each criterion requirement. To the majority of the respondents this was the first time they had learnt about the Bloom's TEO as well as using it to read children's drawings. So, to ensure respondents' understanding of the Bloom's TEO the investigator conducted a 60 minutes power

point session to introduce the operation of Bloom's TEO for evaluating drawings to enhance rating performance (see Appendix G1powerpoint slides). The participants had to assign a rating and justify by identifying evidence in the drawing (also served as evidence of the respondents' understanding and appropriate application of the Bloom' TEO). Some respondents were more comfortable working in pairs or threes although; the majority rated the drawings as an individual. Each pre- and post-lesson drawing was rated at least three times by different respondents. This gave an average pattern of information encoded and also a manageable number for the investigator. Getting respondents to invest at least 90 minutes of participation time was a challenge, in addition to the constraint of room availability to implement the checklist with an average class size of 15 to 30 respondents. Furthermore, the multiple respondents of 140 rating 50 drawings (25 for pre- and 25 for post-lesson drawings) were judged sufficient to improve reliability by allowing random errors of measurement to average out (Spector, 1992).

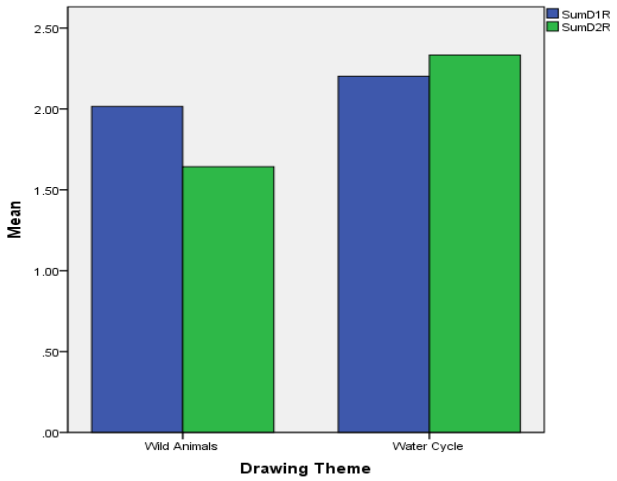
7.6 Findings

Findings and discussions of each individual Bloom's TEO criteria are presented section by section with bar charts and case summaries tables for all six criteria for wild animals and the water cycle drawings. It aimed to find answers to evidence of learning in the children's drawings captured with the Bloom's TEO. However, we must bear in mind that descriptive statistics are good enough to show a general pattern between pre- and post-lesson drawings for all six criteria but not to make inferences for statistical significance.

7.6.1A First cognitive process: "Remember."

Bloom's TEO defined "remember" as a learner's ability to recognize, recall, and retrieve by identifying and labelling things. For Bloom, et. al. (1956), it was the recalling of "isolated bits of information which have some meaning and value by themselves" (p.63). Figure 7.1 shows findings on "remember" criterion for pre-and post-lesson drawings on wild animals and the water cycle.

Figure 7.1 "Remember" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend
SumD1R: Sum of pre-lesson drawing 1Remember
SumD2R: Sum of post-lesson drawing 2 Remember

Table 7.1 Remember criterion case summaries

Drawing Theme		SumD1R	SumD2R
Wild Animals	Mean	2.0159	1.6429
	% of Total Sum	53.8%	47.3%
Water Cycle	Mean	2.2020	2.3333
	% of Total Sum	46.2%	52.7%
Total	Mean	2.0978	1.9467
	% of Total Sum	100.0%	100.0%

<u>Comparing within wild animals</u>

Figure 7.1, the total score for Drawing 1 and 2 was on average, 2.0159 and 1.6429 respectively. For wild animals the mean total score for Drawing 2 is much lower as compared to Drawing 1 by (2.0159-1.6429) 0.373.

<u>Comparing within water cycle</u>

Figure 7.1, the total score for Drawing 1and 2 is on average 2.2020 and 2.3333 respectively. For water cycle, the mean total score for Drawing 2 is slightly higher as compared to Drawing 1 by (2.3333-2.2020) 0.1313.

Comparing between the two drawing themes

Overall, the children performed better for wild animals Drawing 1 but for water cycle Drawing 2 was slightly better. Between themes, water cycle had a better performance for both drawings than wild animals. However, the difference in the mean total scores between Drawing 1and 2 is at much larger extent for wild animals (0.373) as compared to the water cycle (0.1313).

7.6.1B Discussion: "Remember"criterion.

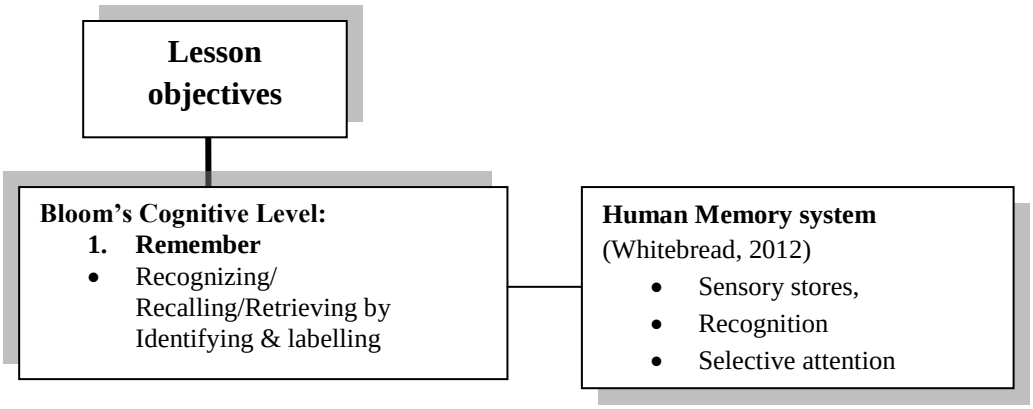
Although, it may not be age appropriate to expect 5 (Kindergarten I) to 6 years old (Kindergarten II) children to spell and label in writing but Singapore teachers do place a great emphasis on literacy. Therefore, the investigator had specified to the respondents that *verbal* labelling of things were accepted as indicators of remembering process. So, what information of wild animals or the water cycle was remembered? Chapters 5 and 6 had provided information of what was remembered as factual knowledge under coding checklists. In brief, the majority of the respondents had no problem identifying isolated labellings in the drawings cited as evidence of "remember" (see Appendices G2 & G3). The mean difference between Drawing 1 and 2 wild animals and the water cycle for "remember" process was negligible (see Table 7.1). What was the implication? With respect to pre-lesson drawings it showed the children could recall and identify theme relevant information prior to their teacher's teaching. The children displayed relevant and extensive vocabulary to frame understanding of wild animals by identifying "mandrill;" "gila monster;" "porcupine;" "python;" "rainforest" and many more (see Appendices E1 – E28). For the water cycle, the children recognized by identifying water in various forms (e.g. sea, ocean, and river) and ideas (e.g. shower, raining, and dark clouds) associated with water/rain (see Appendix F1 – F23).

The findings showed the two teachers promoted "recall" skills as specified in their lesson objectives – words and pictures matching to "identify the four stages of water cycle," and to "name and spell 11 wild animals." Early years teaching emphasized on vocabulary acquisition because it aimed to help children to frame

concepts and understanding with language. Therefore, it is common to hear Singapore teachers asking "Children - who can tell me what this is?" teachers testing children's recall and recognition skills. Figure 7.1 showed both teachers' lessons had negligible impact on the children's recall of specific and isolable bits of information, although, water cycle showed a slight increase. What is the relationship of a child demonstrating the ability to "remember" with learning?

Goswami (1998) explained that children's ability to remember was a demonstration of memory that simultaneously displaying learning. On the contrary Bransford and Vye (1989) suggested the "ability to remember depend strongly on the nature of information we had previously acquired" and not "memory ability" (p. 177). Perhaps, Whitebread's (2012) proposition reconciled the above dichotomy. She suggested learning is triggered in the human memory system made up of "sensory stores, recognition and selective attention" (p.94). Memory ability is needed for "recognition" of the "nature of information" for matching old and new knowledge that triggered "selective attention." (see Figure 7.2).

Figure 7.2 Remember process and underlying cognitive elements



According to this model, incoming information from the environment is first screened and received via the five sensory receptors and stored accordingly. Next, recognition, the earliest and simplest form of memory is monitored by establishing neuron patterns, pattern matching and making links between patterns of new and previously stored information. Once pattern match is found and recognised, learning takes place. It then triggers selective attention when activities planned for young

children were interesting, intriguing and personally relevant, to hold their attention. But it must involve:

> *A strong element of recognition, together with the promise of new information related to <u>what they already know</u>. If it does not, attention will be easily diverted and all the important information the adult practitioner has carefully planned and prepared will be discarded from their sensory stores within 0.5 seconds.*
> (_ *added*; Whitebread 2012, p.97).

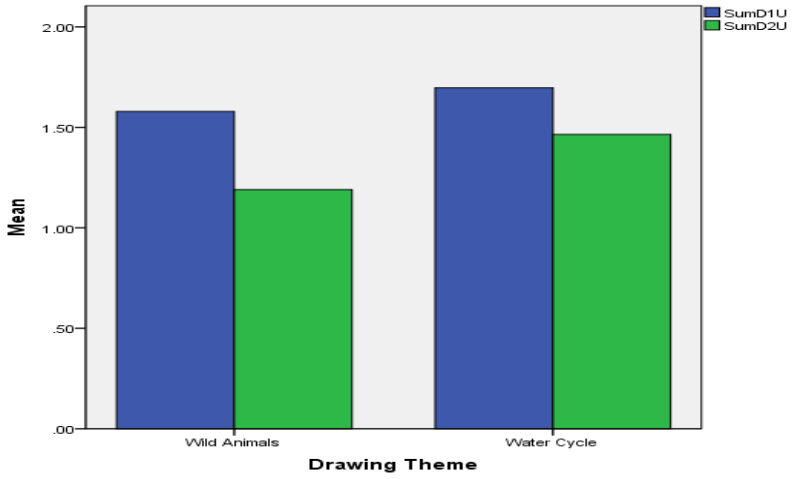
Was there strong element of recognition promoted in the teaching of wild animals and the water cycle? Chapters 5 and 6 findings showed the children were familiar with wild animals in their pre-lesson drawings showing concepts of wild animals in the open or caged, and notions of prey and predator survival behaviour in the animal kingdom. In other words, there was an acceptable level of recognition and knowledge the children could match to what they already know about wild animals. However, for the water cycle there were elements of familiarity of rain coming from clouds set in landscape scene. But the children established individual elements of recognition by matching it with water moving along drainage pipes unknown to the teacher who thought that by getting children to match water cycle terminology to pictures sufficed as learning. This led us to question whether there was the promise of new information building on what the children already know. Wild animals findings showed evidence of a bombardment of diverse new information (see Chapter 5) that lacked building on children's specific interests about "bat and eagle," "growth and development, and animal-injury." For the water cycle, there was promise of new abstract information of water movement in "evaporation" and "condensation." But these were beyond the children's grasp, in contrast to clouds, rain, water collection and drainage pipe, easily seen in a child's environment. When children find little recognition of relevance to their prior knowledge or experiences negligible information is retained or remembered. The data illustrated attest to Bransford & Vye's (1989) notion that learning to a greater extent is dependent strongly on the nature of information we have previously acquired rather than on memory ability alone.

The Bloom's TEO checklist deepened understanding of how factual knowledge was organized in children's "remember" thinking processes in the light of literature about memory and understanding. Goswami (1998) summed up "in cognitive psychology, learning is usually measured in terms of what has been remembered as a result of learning either via measures of recognition or recall" (p.60). Therefore, the Bloom's TEO as a framework to measure the children's learning based on what has been remembered evidenced in the drawings probably gave an agreeable indication not only of the teachers' lesson but the framework's effectiveness too.

7.6.2A Second cognitive process: "Understand."

According to Anderson and Krathwohl (2001) conceptual knowledge is constructed when a child builds connections between the "new" knowledge to be gained and their prior knowledge (p.70). A child's understanding is measured by his/her ability to transfer knowledge (either orally, bodily, written or graphic forms) by means of interpreting; exemplifying; and classifying, and not relying on memory alone. Figure 7.3 reports on "understand" process performance.

Figure 7.3 "Understand" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend
SumD1U: Sum of pre-lesson drawing 1 Understand
SumD2U: Sum of post-lesson drawing 2 Understand

Table 7.2 Understand criterion case summaries

Drawing Theme		SumD1U	SumD2U
Wild Animals	Mean	1.5794	1.1905
	% of Total Sum	54.2%	50.8%
Water Cycle	Mean	1.6970	1.4646
	% of Total Sum	45.8%	49.2%
Total	Mean	1.6311	1.3111
	% of Total Sum	100.0%	100.0%

Comparing within wild animals

Figure 7.3 the total score for Drawing 1 and 2 is on average, 1.5794 and 1.1905 respectively. For wild animals the mean total score for Drawing 2 is much lower as compared to Drawing 1 by (1.579 - 1.191) 0.398.

Comparing within water cycle

Figure 7.3 the total score for Drawing 1 and 2 is on average 1.6970 and 1.4646 respectively. For water cycle the mean total score for Drawing 2 was slightly lower as compared to Drawing 1 by (1.697 – 1.465) 0.232.

Comparing between the two drawing themes

Overall, the 140 teacher-respondents showed the children performed better for Drawing 1 than 2 for both themes. Between themes, water cycle had a better performance for both drawings than wild animals. Furthermore, the difference in the mean total scores between Drawing 1 and 2 is at a much larger extent for wild animals (0.398) as compared to water cycle (0.232).

7.6.2B Discussion: "Understand" criterion.

How are concepts changed and learned? What changed exactly and why the change? To answer these questions we need to look at cognitive theories on how children think and learn. Anderson and Krathwohl (2001) explained that "conceptual knowledge is a deeper, more organized integrated and systemic knowledge than just knowledge of terminology and isolated facts" (p. 62) because it

is intimately linked to the ability to categorise (Goswami, 1998 p.73) based on similarities and differences among categories within the larger system of classification (Tennyson, 1995 cited in Anderson and Krathwohl et. al. 2001, p.7). Goswami (1998) postulated that conceptual knowledge is "meaning-based knowledge representations of concepts e.g. birds (has wings, has beaks, can fly... etc.) and schemas for event such as going to the doctor (report to receptionists, wait a long time, enter surgery) of categories" (p.53). What influenced conceptual development? Goswami (1998) identified three elements:

- A child's ability to categorise. Neisser (1987) defined categorisation as "to treat a set of things as somehow equivalent, to put them in the same pile, or call them by the same name, or respond to them in the same way" (p.1 cited in Goswami, 1998, p. 73). The ability to categorise was influenced by perceptual differences that had conceptual significance for children.

- The role of language, in learning new words, played a role in developing children's conceptual relations between objects and classes of objects (p.85).

- Analogy as a mechanism for developing conceptual development especially in understanding a variety of biological principles to explain causal-effect, predict about biological phenomena on analogies to people related to living things and having young (p.97 & 100).

Figure 7.3 shows the respondents found more evidence of conceptual knowledge of wild animals and the water cycle demonstrated in Drawing1 than Drawing 2. They cited evidence of the children's ability to categorise wild animals into air (eagle, parrot, and bat), land (lions, giraffe, and tiger) and water (sharks, hippopotamus); animals' family units by e.g. grouping giraffes together or pythons together. There was also evidence of explaining and predicting (e.g. "*lion wanted to attack porcupine*") (see Chapter 5). Basically, the children could categorise by drawing and selecting animals belonging to the category of wild animals. There was no evidence of farm animals e.g. goat, sheep, and pig included in the drawings, except for Child P01's Drawing 2 "*witch turned it (rhino) into a duck*" (Piaget's notion of "fortuitous" realism may be in operation here because the child seemed to perceive a

structural/perceptual similarity between a duck's opened beaks, coloured in grey protruding prominently looking like a rhino's horn. For the water cycle drawings, the children drew things related to water although, not strictly about the water cycle from an adult's perspective. It is worth noting that nothing of "fire" was included in the water cycle theme. Clearly, the children had demonstrated reasoning qualified as theme-related ideas, and organised conceptual knowledge according to "thematic relations" and associations (e.g. animals in the wild were associated with open landscape of the sun, trees, and river or zoo-caged side-by-side looking at each other) (Goswami, 1998). The children did not merely organize knowledge based on categorical relations of giraffe-to-giraffe family relation but a thematic one (see Chapters 2; 5 and 6). Smiley and Brown (1979) found 4- and 6-year old children had a preference for thematic over categorical relations (Goswami, 1998, p.102). Either way, the Bloom's TEO had captured information for teachers to learn and observe the development of conceptual understanding. This is summed up in Figure 7.4 elements involved in conceptual development.

Figure 7.4 "Understand" process and the underlying cognitive elements

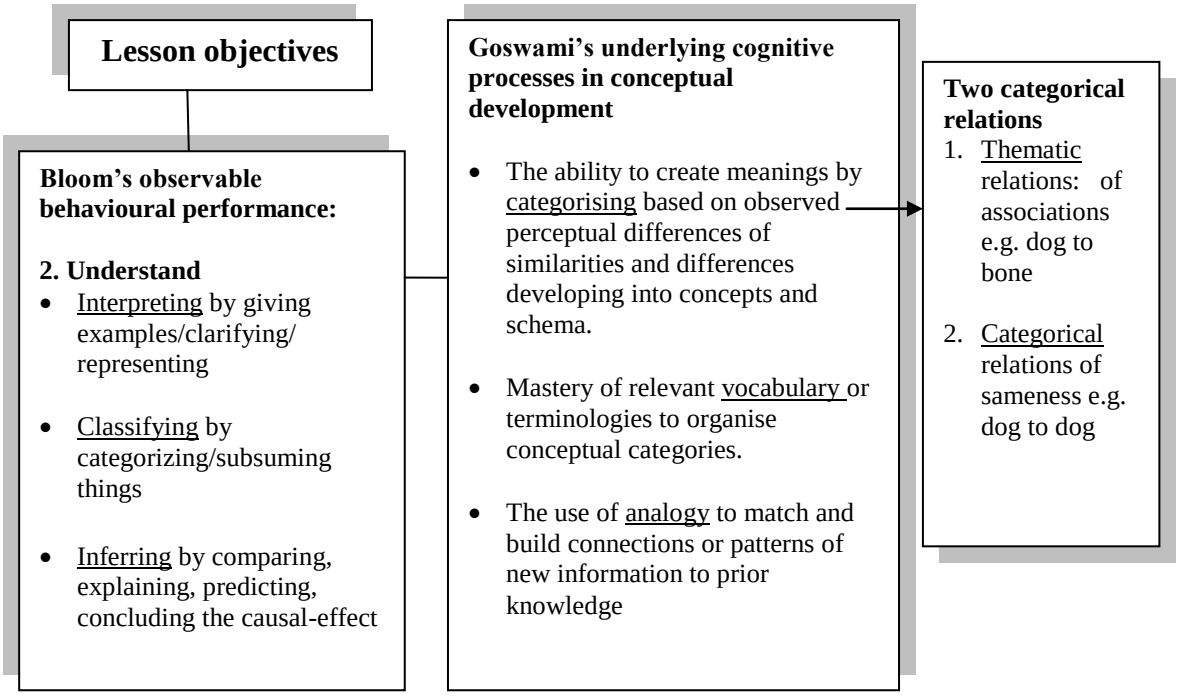
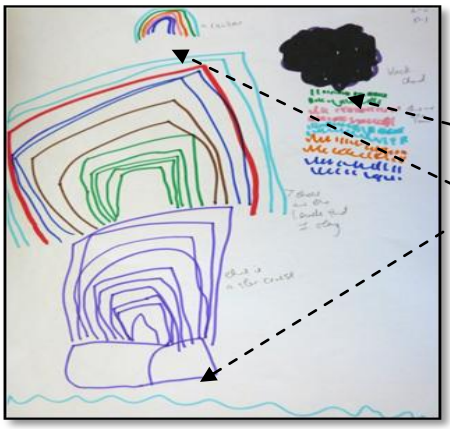


Figure 7.4 shows when children's conceptual development is seen in the light of the Bloom's TEO and Goswami's model it offered a deeper understanding of the mechanisms activated by drawing. Figure 7.5 showed respondents found drawing-evidence of children demonstrating understanding skills in interpreting, classifying and inferring underlying Goswami's proposed processes involved in conceptual development.

Figure 7.5 Respondents' comments and evidence cited for "Understand" criterion

Children showed understanding by interpreting by giving examples of how things/objects function or associate with something else:	
Children's drawings/descriptions	**Respondents' comments and evidence cited to support their ratings**
 **Appendix E25**	*"Knows that the king cobra gets angry when there's no meat."* *"Giraffe eats leaves from trees, child draws arrows; snake's home in a tree as indicated by yellow arrow."* *"Able to associate pathways for walking in map."*
 **Appendix F1**	*"Ship on water; black cloud & rain."* *" Able to understand that precipitation happen when the clouds became heavy due to condensation."* *"Able to relate rain with rainbow."*

Children showed understanding by classifying by categorising / organising things/objects according to functions/ purposes/ placement:

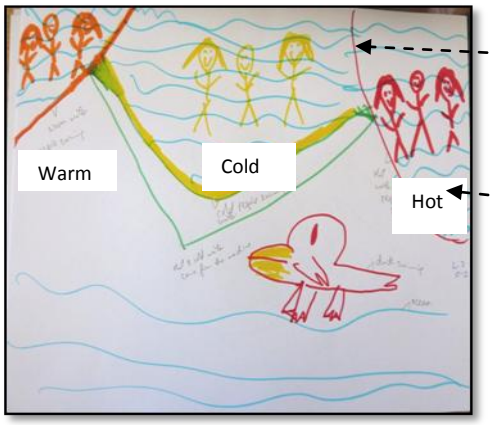
"Some classification knowledge in the chid. Most animals have 4 legs."

"The eagle & bat are seen (at higher level) flying above the other land animals; the sun is at a higher level too."

"Grouping: Eagle & bat; tree & ground animals – lower ground."

"Flying animals in air, land animals on ground level looking at the animals."

Appendix E3



"Duck swimming in natural setting eg. Ocean; water coming from machine eg. Swimming pool; Jacuzzi."

"Able to classify warm, cold, and hot water."

- Grouping of human beings together clearly separated from the duck

Appendix F18

Children showed understanding by inferring comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects:

"This lion wants to chase this lion because this lion loves this lion becos is cute."

"Bat wants to eat leaves scare to cross to tree becos later eagle eat the bat."

"Bat scare to cross the path becos' the eagle is around."

Appendix E15

Appendix F9

"Water cycle when water fall in drain it will recycle as tap water."

"Water from shower."

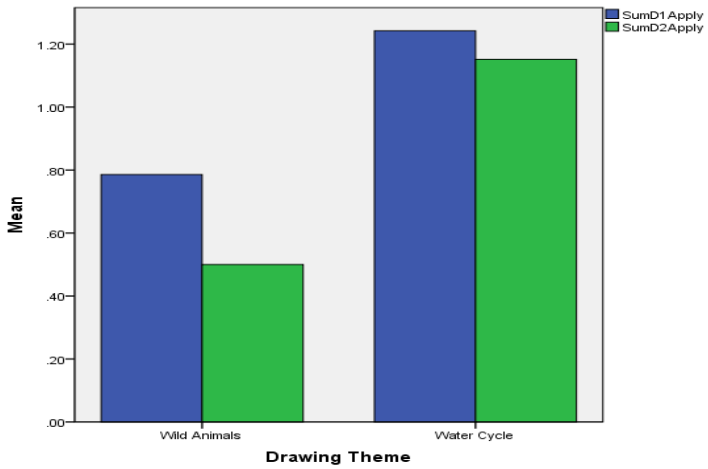
"River water to toilet, toilet water to drain."

When teachers begin to see with the help of the Bloom's TEO cognitive processes induced by drawing, they may consider drawing as an informal assessment tool to assess evidence of learning and thinking to inform their practices.

7.6.3A Third cognitive process: "Apply."

Anderson and Krathwohl, (2001) defined apply as executing (carrying out) and implementing (using) a procedure to determine what/where/how/when/why-things/objects/people/events came from and where it went. Of course, the study's emphasis was on a child's knowledge of a procedure and not his/her ability to use the procedure (Bloom et. al., 1956).

Figure 7.6 "Apply" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend
SumD1A: sum of pre-lesson Drawing 1 Apply
SumD2A: sum of post-lesson Drawing 2 Apply

Table 7.3 Apply criterion case summaries

Drawing Theme		SumD1Apply	SumD2Apply
Wild Animals	Mean	.7857	.5000
	% of Total Sum	44.6%	35.6%
Water Cycle	Mean	1.2424	1.1515
	% of Total Sum	55.4%	64.4%
Total	Mean	.9867	.7867
	% of Total Sum	100.0%	100.0%

Comparing within wild animals

Figure 7.6, the total score for Drawing1 and Drawing 2 is on average .7857 and .5000 respectively. For wild animal the total score for Apply criterion for Drawing 2 is (.7857 - .5000) 0.2857 lower than Drawing1.

Comparing within water cycle

Figure 7.6, the total score for Drawing1 and 2 is on average 1.2424 and 1.1515 respectively. For water cycle the mean total score for Apply criterion for Drawing 2 is (1.2424-1.1515) 0.0909 lower than Drawing1.

Comparing between the two drawing themes

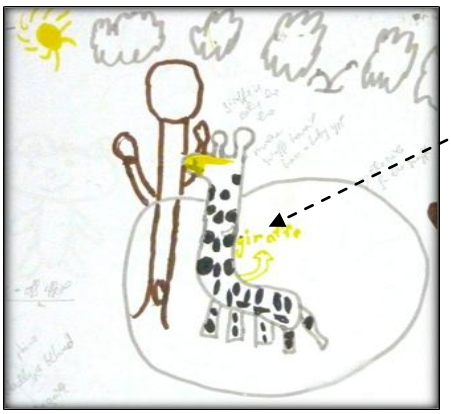
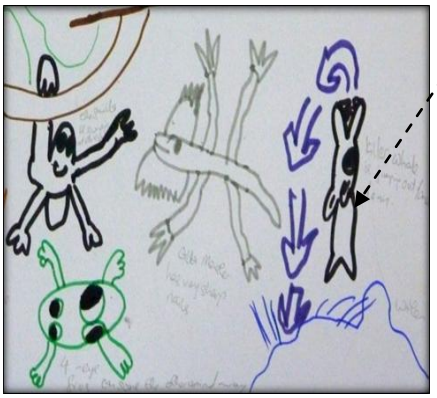
Overall, the children performed better for Drawing 1 than 2 for both themes. Between themes, water cycle had a better performance for both drawings than wild animals. Furthermore, the difference in the mean total scores between Drawing 1 and 2 is at a much larger extent for wild animals (0.286) as compared to water cycle (0.09).

7.6.3B Discussion: "Apply" criterion.

Application is about "knowledge of how to do something" by determining where things come from and where it goes "expressed as a series or sequence of steps, collectively known as procedure" (Anderson & Krathwohl, 2001, p. 52 & 53). In other words, the focus of our discussion is about "comprehension" and "transference" of knowledge of sequence of steps and not "application" of a procedure in real situation (Bloom, 1956, p.120 & 122). This study has found

"apply" criterion may be thematically induced. Figure 7.6 shows "apply" process was more dominant in the water cycle drawings than wild animals. The water cycle demands knowledge of the phases/sequences of change - solids, liquids and gases. At this point, the Bloom's TEO as a drawing evaluation checklist had proven to be quite reliable by illuminating what it set out to measure even though it was new to the 140 teacher-respondents. Matthews, (1999) also found evidence of children's interest in investigating where things come from and where it goes; showing awareness and attention to Bloom's notion of procedural knowledge. Thus, inevitably some children spontaneously injected elements of application in their wild animals drawings too. Figures 7.7 and 7.8 showed evidence of respondents' comments to justify their ratings for children's procedural knowledge for wild animals and the water cycle respectively.

Figure 7.7 Respondents comments and evidence cited for "Apply" criterion for wild animals drawings

Children's descriptions	Respondents' comments and evidence cited to support their ratings
 *"Mother giraffe haven't born a baby yet"* **Appendix E28**	*"Child determined baby giraffe came from mother giraffe."*
 *"Killer whale jumping up then down"* **Appendix E14**	*"Determining the sequence of a whale's jump parabola in time and space."*

"Butterfly already suck the nectar in the flower and fly away"

"Travelling dots to sequence the steps involved from nectar to flower to fly away."

Appendix E24

"Child determined a pathway for people to walk"

"Child drew pathways likened to a zoo-map to track where and how people move from one enclosure to."

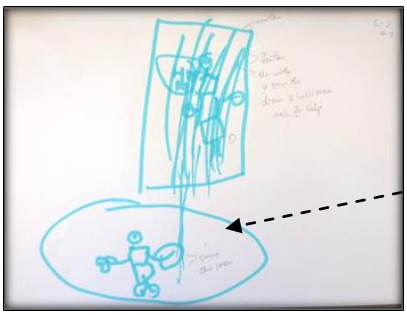
Appendix E25

"Squirrel crawl up the tree then eat the nuts."

Sequence of steps: crawl up then eat the nuts

Appendix E15

Figure 7.8 Respondents' comments and evidence cited for "Apply" criterion for the water cycle drawings.

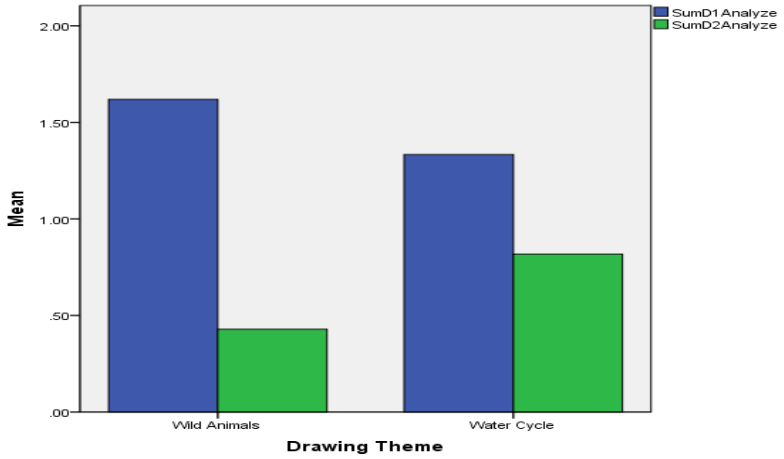
Children's description	Respondents' comments and evidence cited to support their ratings
 "Raindrops come from cloud" **Appendix F7**	*"The sky gets darker and there will be thunder when it rains."* *"Dark clouds results in rain."* *"Umbrella is needed when there is rain."*
 "When the water falls in the drain it will go here" **Appendix F9**	*"Water from the river is needed for human use."* *"Water is recycled from river and drain."* *"Water from shower head flowing downwards to river & drain through a pipe."*
 "Ocean water goes in the drain" **Appendix F13**	*"Water cycle of how it rains water in the ocean flows into drain."* *"Rain from sky"* *"Water from drain goes to the sea."*
 "The water is going to drown this person ask for help" "This man saving the person" **Appendix F6**	*"The person who is trying to save the other holds onto a lifebuoy."* *"To render help when someone needs."* *"When someone is in danger, there is help."*

Anderson and Krathwohl, (2001) argued that experts know when and where to apply their knowledge (p.54). The children seemed to be experts in their implicit transference of knowledge by analogizing water pipes to water movements implied in the water cycle's phases of change. Perhaps, the "apply" criterion reminded us of children's incessant asking of "why and where" for example, "Daddy, where are you going?" or "Mummy where do babies come from?" supported by Piaget's studies of children's understanding of causal-effect. The children may not have grasped the true "meaning" of the water cycle phases of change from solid - gas - liquid but they seemed to have grasped the "intent" of the material of water moving from one point to another (Bloom, 1956, p.144). Perhaps, it is essential for teachers to recognize children demonstrating understanding of the "*intent"* of the material as equally important to displaying direct understanding of the material taught. A teacher equipped with this understanding may be better at scaffolding the child to the next zone of proximal learning and not dismiss a child's knowledge of "material-intent" as irrelevant. In other words, teachers evaluating drawings for information with the Bloom's TEO may be more sensitized to children demonstrating knowledge of "material-*intent"* in contrast, to a teacher merely checking against a coding checklist for the presence or absence of evidence of learning.

7.6.4 A Fourth cognitive process: "Analyze."

To "analyze" is to differentiate by identifying relevant from irrelevant (in events/people/objects) by organizing, and attributing (a point of view, bias, values, or intent underlying a situation) into form and pattern of how parts relate to one another and to an over-all structure or purpose (Bloom et. al.1956; Anderson and Krathwohl (2001)). Most respondents could read drawing-evidence of children organizing different ideational elements to produce a thematic drawing (see Figure 7.9).

Figure 7.9 "Analyze" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend
SumD1A: sum of pre-lesson Drawing 1 Analyse
SumD2A: sum of post-lesson Drawing 2 Analyse

Table 7.4 Analyze Criterion Case Summaries

Drawing Theme		SumD1Analyze	SumD2Analyze
Wild Animals	Mean	1.6190	.4286
	% of Total Sum	60.7%	40.0%
Water Cycle	Mean	1.3333	.8182
	% of Total Sum	39.3%	60.0%
Total	Mean	1.4933	.6000
	% of Total Sum	100.0%	100.0%

<u>Comparing within wild animals</u>

Figure 7.9 the total score for Drawing 1 and 2 is on average, 1.619 and 0.428 respectively. For wild animals, the mean total score for Drawing 2 is much lower in comparison to Drawing 1 by (1.6190-0.4286) 1.1904.

<u>Comparing within water cycle</u>

Figure 7.9 the total score for Drawing 1 and 2 is on average, 1.3333 and 0.8182 respectively. For water cycle the mean total score for Drawing 2 is much lower in comparison to Drawing 1 by (1.3333-0.8182) 0.5151

Comparing between the two drawing themes

Overall, the children performed better for Drawing 1 than 2 for both themes. Between themes wild animals had a better performance for Drawing 1 than water cycle. Furthermore, the difference in the mean total scores between Drawing 1 and 2 is at a much larger extent for wild animals (1.1904) in comparison to water cycle (0.5151).

7.6.4B Discussion: "Analyze" criterion.

The drawings showed evidence of children identifying elements (names and isolated factual information) and forms and patterns (conceptual knowledge) related to the wild animals and the water cycle themes (see Chapters 5 and 6). Could 5 to 6 years children demonstrate analytical skills? The data suggest they could, but not without some common errors in analysis. According to Bloom, et. al, (1956) they are:

1. Crude errors: misjudging the nature of elements or the relationships between elements. Confusing basic and subordinate elements. Inability to identify forms and patterns.

2. Incomplete analysis: may be essentially "on the right track," but misses some of the elements, relationships or principles.

3. Over-analysis: breaking it up into more minute elements than is appropriate for the given material thus missing the more important relationship (p.150)

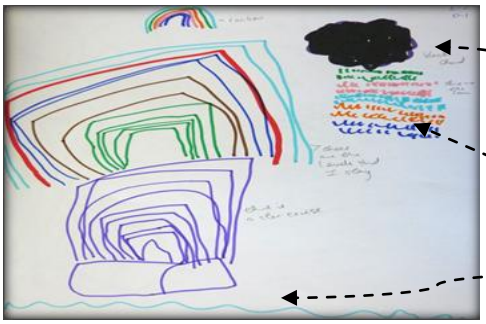
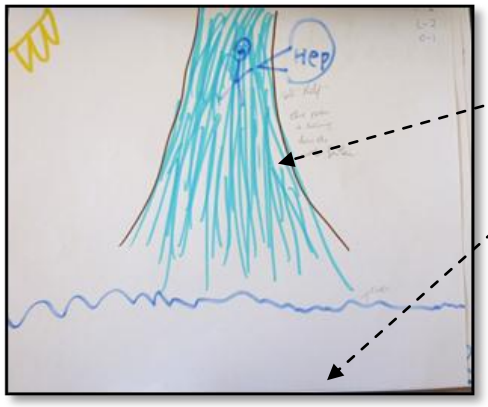
The children committed some "crude errors" by mixing up between the basic element of "wild animals" and its subordinate zoo animals. The confusion perhaps was due to the teacher's not stating her expectation clearly to the children. However, on a more positive note, it actually revealed the children's rich spontaneous knowledge of two distinctive classes of animals. While for the water cycle drawings, the children committed crude errors and incomplete analysis. They were confused between man-made water "cycle" via water pipes and the natural water cycle

missing the principle of the phases of change (solid, liquid and gas). Figure 7.10 shows examples of the respondents picking up children's analytical skills embedded in the drawings with the Bloom's TEO checklist.

Figure 7.10 Respondents' comments and evidence cited for "Analyze" criterion

Analyze: Differentiating people / events/ things /objects by distinguishing / selecting:

- Relevant from irrelevant parts
- Organizing coherence / structuring how elements fit or function
- Determine a point of view, bias, values, or intent underlying the situation

Child's description	**Respondents' comments and evidence cited to support their ratings**
 **Appendix F1**	**Selecting relevant from irrelevant parts** *"She drew things that are relevant to water cycle such as ocean, black clouds."* *"Able to correctly draw coherently the process of precipitation and collection.*"
 **Appendix F17**	**Organizing coherence / structuring how elements fit or function** *"Differentiate between water fountain and river; differentiate the flow and the current in rivers and fountains"* *"Has the concept and understanding that after an upstream fountain; comes a downstream river; instead of other structures (finding coherent within structures of water forms)"* **Attributing a point of view/underlying intent** *"Person in danger calling for 'help!'"*

Appendix E25

Differentiating by distinguishing relevant from irrelevant parts

"Identifying things in the zoo, zebra have stripes, leopard & jaguar have spots"

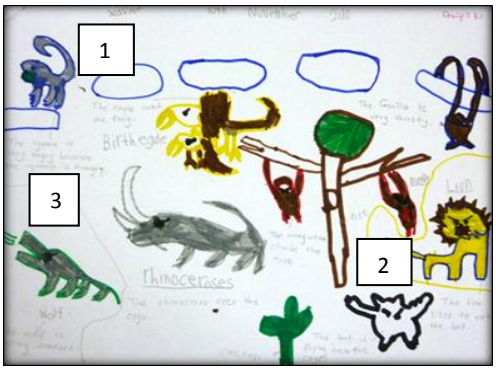
"Able to differentiate that giraffe has long neck and snake is coiled"

Organizing by finding coherence / structuring how elements fit or function

"The child included all the relevant things in the zoo"

"The animals have their own designated places"

"Organizing animals in their enclosure with pathways"



1. *"The iguana is very angry because the iguana is hungry;"*
2. *"The lion likes to eat the bat;"*
3. *"The wolf is calling someone*"

Appendix E27

Determine a point of view or intent underlying the situation

"The wolf is howling; calling someone"

"Iguana – angry; wolf-calling by howling; lion-fierce

Teachers need to take note of children's inherent thinking skills to create "educational possibilities" because the goal of education is retention ("remember") and transference of learning ("understand, apply, analyse, evaluate, and create") (Anderson & Krathwohl, et. al., 2001, pp. 65 & 236). Indeed, it could be argued that the very moment when the children were told to draw, analytical thinking was activated. The children were observed pausing, thinking, looking around at their friends and musing "what shall I draw? What constitute a picture of wild animals/the water cycle?" "How shall I differentiate between a daddy bear from a mummy/baby bear?" or "How shall I attribute a point of view to show that the bat is scared of being eaten by an eagle?" The elaborate drawings/narratives bore evidence of "children draw to think, and think to draw." Drawing is a cognitive activity. Therefore, teachers need a framework to help them to assess children's draw-to-think processes to fully comprehend the significance of children's drawings having bearing on teaching and learning. At this point keeping with the discussion on analysis, it is appropriate to discuss the respondents' performance in analyzing drawings with the Bloom's TEO.

To analyze drawings with the checklist was a new experience for the majority of the respondents; they may commit errors of incomplete or over-analysis, if not careful. Although, most of the respondents were able to provide acceptable evidence to support their "analyse" ratings (see Appendices G2 & G3 raw data of the respondents' evaluations), an estimated 20% respondents committed errors of over-analysis in their effort to analyse the drawings:

> *"Associating to Einstein (genius) maybe the child thinks so this is his masterpiece as he can draw genuiously."*
> (Appendix F23)

> *"Child drew floating fruits on the sea, probably child seen floating coconuts before."*
> (Appendix F21)

> *"With the drawing of the 'sun' it show his positivism; hope for surviving."*
> (Appendix F17)

Over-analysis is reading more ideas into the drawing than appropriately supported by the actual evidence seen. However, some respondents rightly commented that appropriate analysis with the checklist takes time to develop:

> *"It is easy to use, once you get past the overlapping of processes."*

> *"Expect this to become easier as we are exposed to more drawings."*

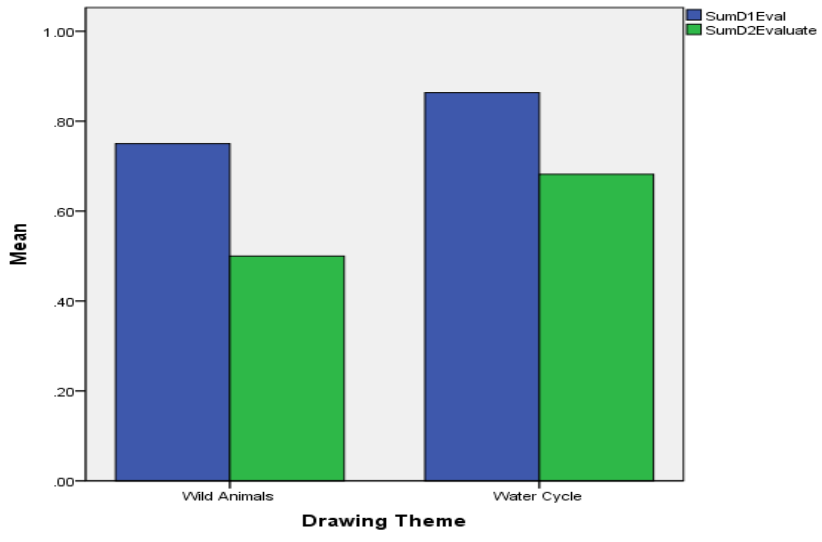
> *"Need more time to familiarise myself with the form."*

About 75% respondents commented the Bloom's TEO enhanced their capacity to analyse children's drawings "*objectively*" because it was "*systematic*," "*specific*" and evidence-based.

7.6.5A Fifth cognitive process: "Evaluate."

To evaluate is to make judgments informed by an individual's internal evidence of what he/she considered as logical consistency and accuracy. Judgment could also be guided by external standards of selected or remembered criteria as frame of reference to detect inconsistencies and appropriateness (Bloom, 1956; Anderson and Krathwohl, 2001).

Figure 7.11 "Evaluate" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend	
SumD1Eval:	sum of pre-lesson Drawing 1 Evaluate
SumD2Evaluate:	sum of post-lesson Drawing 2 Evaluate

Table 7.5 Evaluate criterion case summaries

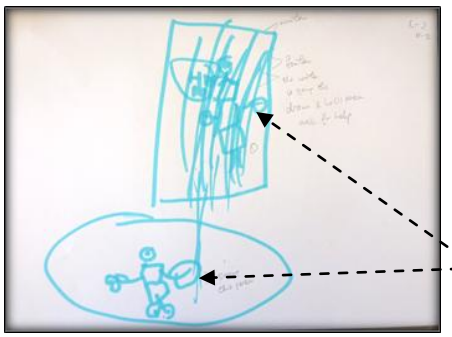
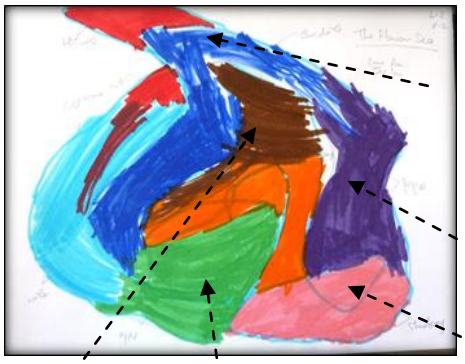
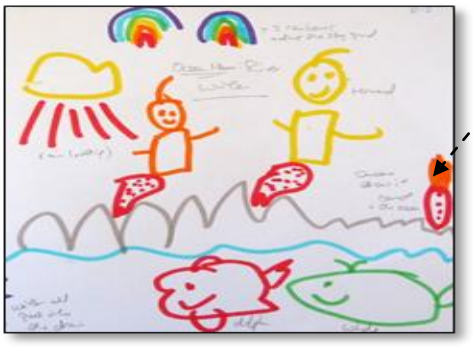
Drawing Theme		SumD1Eval	SumD2Eval
Wild Animals	Mean	.7500	.5000
	% of Total Sum	52.5%	48.3%
Water Cycle	Mean	.8636	.6818
	% of Total Sum	47.5%	51.7%
Total	Mean	.8000	.5800
	% of Total Sum	100.0%	100.0%

Figure 7.11 showed very negligible evidence of evaluation demonstrated in the drawings. Wild animals Drawing 2 a slight drop of mean (0.25) and the water cycle (0.182). On the whole, the water cycle theme elicited more spontaneous evaluation from the children. The reason may be due to the thematic scientific slant involving scientific process skills similar to a "combination of skills such as remember, understand, apply, analysis, create and criteria of values" for evaluation (Bloom, 1956, p.185). Figure 7.12 shows evidence and respondents' comments on evaluate process found in the drawings.

7.6.5B Discussion: "Evaluate" criterion

Bloom (1956) suggested evaluation involved affective behaviours such as values, liking, and enjoyment where an individual sometimes made "quick decisions or opinions not preceded by very careful consideration of the various aspects of the object, idea or activity being judge" (p186). It stemmed from a highly egocentric perspective. Figure 7.12 shows examples of children making quick decisions and detecting inconsistencies while making an effort to draw things pertaining to the theme. This was in keeping with Matthews (1999) who also observed elements of humour in children's drawings.

Figure 7.12 Respondents' comments and evidence cited for "Evaluate" criterion

Evaluate: Make judgments based on criteria and standards	
Children's descriptions	**Respondents' comments and evidence cited to support their ratings**
 *"The fountain water is going to drown and he ask for help"* *"Saving this person"* **Appendix F6**	1. **Criteria of what constitute a drowning event** –elements of danger, water, shout for help, and rescue effort *"Able to make judgment that drowning might occur."* *"The figure is drowning in the water and so he/she asks for help."* *"The figure is drowning in the water and so he/she asks for help."*
 *"The Flavour Sea come from the rain."* *"grape"* *"strawberry"* *"chocolate"* *"apple"* **Appendix F22**	2. **Criteria of elements that constitute a "flavour sea": tastes & colours** *"The drawing is called flavour of sea 'cos there is different flavours in drinks"*
Evaluate: Critique by judging and detecting inconsistencies and appropriateness	
 *"Someone threw carrot in the ocean"* **Appendix F14**	**Carrot in the ocean?** *"A carrot appears in the corner for humour."* *"The mermaid's tails resemble a carrot so child drew a carrot then knowing carrot doesn't belong in ocean, child said someone threw it in."*

The child giggling said "Fly dook (sting) the eagle; so got plaster…"

Eagle and plaster?

"Drawing of an eagle with a plaster"

Appendix E15

"The baby parrot eat the diaper" – child then added (?) to show astonishment and absurdity.

Parrot eats diaper?

"Baby parrot eating diaper. Eagles with plasters"

Appendix E18

The findings showed the checklist could flash out nuances of playfulness displaying the "highest form of intellectual activity" (Hope, 2008, p.17 cited in Ring, 2010, p.114). Although, Hope (2008) did not elaborate on what she meant by the "highest form of intellectual activity" the Bloom's TEO clearly classified evaluative thinking, the fifth highest out of six cognitive processes. The traditional use of a simple information coding checklist in science education or lesson objectives aligned coding checklist (see Chapters 5 and 6) could have easily missed out on such fundamental indicators of "intellectual growth and emotional well-being" in children's "playful approach to drawing" (Ring, 2010, p.114). Young children's drawings were part of their playful, meaningful and multi-modal engagement with the world (Ring, 2010). Wood (2010) suggested it is a demonstration of wit, cognitive flexibility, spontaneity, telling and laughing at jokes, and funny stories, teasing similar to Piaget's notion of "ludic symbolism" in make-believe play (cited in Wood, 2010, p.155). What aspects of knowledge could inform teachers' practices? Perhaps, teachers gaining insight into children's evaluative thinking

probably could make a conscious effort to promote children's sense of internal and external criteria (by asking more "why" questions e.g. "why do you like…") for children to evaluate learning materials. When it is done with added elements of playfulness it may go a long way to help children to retain the information taught. This led to the last finding and discussion on the sixth cognitive process "create."

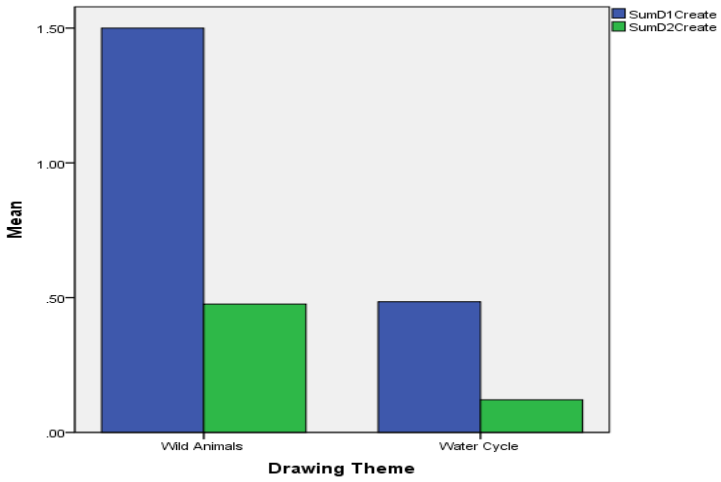
7.6.6A Sixth cognitive process: "Create."

Anderson & Krathwohl,(2001) defined create as generate by planning and producing by putting elements together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before, such as:

1. Generate by coming up with alternative hypotheses based on criteria
2. Plan by designing a procedure to accomplish a task
3. Produce by constructing or inventing a model or product

Bloom (1956) elucidated it is a process that called for "creative behaviour" of originality and uniqueness on the part of the learner (p.162). This process involved a combination of understanding, apply and analysis, by drawing elements from many sources and putting elements together to construct meaning. Figure 7.13 shows the findings were:

Figure 7.13 "Create" criterion performances for wild animals and the water cycle pre-and post-lesson drawings



Legend
SumD1C: sum of pre-lesson Drawing 1 Create
SumD2C: sum of post-lesson Drawing 2 Create

Table 7.6 Create criterion case summaries

Drawing Theme		SumD1Create	SumD2Create
Wild Animals	Mean	1.5000	.4762
	% of Total Sum	79.7%	83.3%
Water Cycle	Mean	.4848	.1212
	% of Total Sum	20.3%	16.7%
Total	Mean	1.0533	.3200
	% of Total Sum	100.0%	100.0%

<u>Comparing within wild animals</u>

Figure 7.13 the total score for Drawing 1 and 2 is on average, 1.5000 and 0.4762 respectively. For wild animals, the mean total score for Drawing 2 is much lower in comparison to Drawing 1 by (1.5000-0.4762) 1.0238.

<u>Comparing within water cycle</u>

Figure 7.13 the total score for Drawing 1 and 2 is on average, 0.4848 and 0.1212 respectively. For water cycle the mean total score for Drawing 2 is much lower in comparison to Drawing 1 by (0.4848-0.1212) 0.3636

Comparing between the two drawing themes

Overall, the children performed better for Drawing 1 than 2 for both themes. Between themes wild animals had a better performance for both drawings than water cycle. Furthermore, the difference in the mean total scores between Drawing 1 and 2 is at a much larger extent for wild animals (1.0238) in comparison to water cycle (0.3636).

7.6.6B Discussion: "Create" criterion

Figure 7.14 shows examples of children not committing the error of "over-organizing the synthesis" resulting in drawings being "too artificial or inflexible" (Bloom, et. al. 1956, p.176). Instead, the children demonstrated spontaneity and freedom of activity, one of the most essential conditions to creativity (Bloom, 1956). The children enjoyed the freedom to draw different elements together to invent new models by creating e.g. "tiger-rhino-snake" and "rainbow-face." For the water cycle, they planned by designing a procedure of water movements through pipes. The children also created alternative hypotheses (e.g. lions chasing each other drawn by love and cuteness; see Figure 7.5, p. 220 [Appendix E15]); and carrot in the ocean was due to someone's irresponsible act to explain away odd circumstances (see Figure 7.14, p.219 [Appendix F14]). The Bloom's TEO had reliably illuminated more creative behaviours for wild animals while more of application for the water cycle drawings. There was more room of creativity for wild animals because it dealt with living things that the children were more familiar and could better relate by putting different animals' features/behaviours together to construct meanings. Most probably, this aspect of information might be negated in a coding checklist because creative behaviors are considered as general ability that fall outside of the teacher's lesson objectives or even subject/topic matter.

Figure 7.14 shows evidence of the respondents' reading drawings with the Bloom's TEO checklist illuminated information of children's "general ability" in evaluation and creation, categorized as "critical-thinking skills" based on Madaus's, et. al. (1973) notion of the Y-shaped structure of the taxonomy (see Chapter 2).

Figure 7.14 Respondents' comments and evidence cited for "Create" criterion for wild animals and the water cycle pre-and post-lesson drawings

Create: Generate by coming up with alternative hypotheses based on criteria to account

Children's descriptions

Appendix F14

Respondents' comments and evidence cited in their ratings

Criteria: things that belong to the ocean (the odd one out)

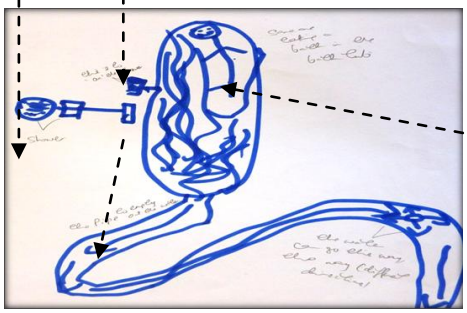
"The mermaid's tails resemble a carrot so child drew a carrot then knowing carrot doesn't belong in ocean, child said someone threw it in."

The mermaid's tails resemble a carrot, so the child drew a carrot then realizing the carrot does not belong to the ocean, child justified by saying "someone threw it in" – it obviously showed the child's knowledge of inappropriateness but she cleverly devised an alternate hypothesis to explain the odd inclusion of a carrot.

Create: Plan by designing a procedure to accomplish a task in drawing

"shower"

"This is to 'on' the shower"



"Someone taking a bath in the bathtub"

"The pipe to empty out the water;
"The water can go this way that way"

Appendix F10

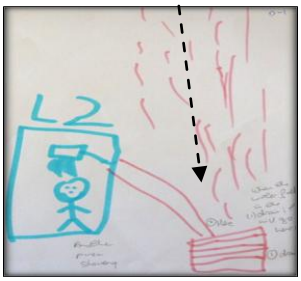
"For people to walk – pathway"

Appendix E25

Create by designing a procedure to determine inlet and outlet of water

"River to toilet to pipe to drain."

"Design the path/flow of water from bath tub to pipe."



Plan by designing a procedure

"Design pathway to each animal"

Create: Produce by constructing or inventing in drawing a model or product

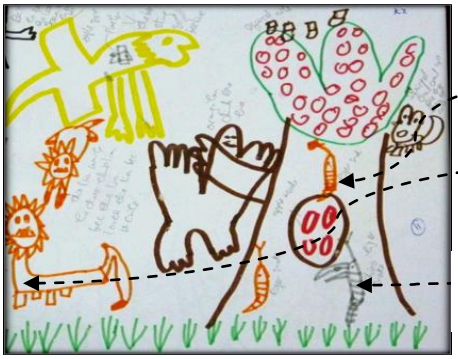
Appendix F10

"Child invented a new model of 'The Flavour Sea.'"

"The child is able to invent a sea of flavours a very abstract idea of."

Appendix E24

"The rainbow has a face with eyes, nose & mouth."



Appendix E15

"Tiger snake"

"Tiger rhino snake"

"Tiger rhino snake; Tiger-snake"

Alternative hypotheses

"This lion wants to chase this lion because this lion loves this lion becos is cute."

When children draw most of the time they are not under "excessive tension and pressures to adopt a particular viewpoint" (Bloom, et. al. 1956, p.173) unlike a Question & Answer session where the teacher may ask leading questions to induce children to converge on the right answer.

7.7 Summary Discussion

Qualter (1996) suggested that without some prior knowledge of children's ideas a teacher cannot begin to plan. Yet simply knowing their ideas is not enough. Teachers need to learn how children think because thinking and learning are closely intertwined. Component III has evidently demonstrated the respondents' abilities to identify an added dimension of information, children's cognitive activities involving the six processes in handling information of wild animals and the water cycle not found in chapters 5 and 6. This answered the following questions the chapter had set out to investigate:

- Do people (teachers) read information in children's drawings? The answer is "Yes."

- Could the Bloom's TEO help teachers unfamiliar to the study of children's drawings find evidence of learning? "Yes."

The findings clearly demonstrated the teacher-respondents' ability to read evidence of learning such as factual knowledge (in the "remember" category), conceptual knowledge (in "understand," and "analysis"), and procedural knowledge (in "apply") involving the six cognitive processes. In other words, the checklist has helped the teachers to know what children bring with them to the lesson and it will help them to plan what to do in the next lesson (Newton, 2000). Below are examples of teacher-respondents' views about the checklist:

> *"Areas are clearly explained. Hence, allowing me to analyse objectively".*
>
> *"Is a powerful tool to show that children's drawing has a lot of credit- for children's intellectual, cognitive development – child can interpret to evaluate and create."*
>
> *"I feel that the rating scale is very helpful for teachers to assess children's level of understanding and cognitive processes."*

"Very systematic way of explaining the process of thinking never thought that simple thinking process involve many aspects."

"We are able to understand and study even more specifically into the child's drawing."

"It is a good tool to gauge the child's level of competence in factual knowledge as well as their emotional stage because if a child has a sense of humour it will reflect in the drawing. Humour reflects a higher level of emotional competency. See lots of potential in this tool to gauge PIES!"
(P-physical; I-Intellectual; E- Emotion; S- social)

"Useful as it gives us a structure- knows what to look out for in children's drawings. Takes time to get used to the terms on the form, although having examples helps. Also difficult to determine what rating to give – but will expect this to become easier as we are exposed to more drawings."

"It highlights features that we may not generally think about e.g. how children associate things they draw with what they know, what they feel. And looks into this aspect deeply."

The drawing-evidence and respondents' comments indicated the Bloom's TEO checklist is a potential tool to read information of children's drawings. Indisputably, at this point, the study has found evidence of information teachers could utilize to inform lesson planning. The information found was discussed in chapters 5, 6 and 7. In other words, employing the Bloom's TEO to read children's drawings had bridged the gap between theoretical excellent expositions about children's drawings and classroom practices (see Chapter 2).

However, the findings also showed about 25% respondents had some difficulties in reading drawings even with the Bloom's TEO. The respondents' feedbacks were grouped into three conceptual categories: "checklist content;" "checklist formatting" and "difficulties faced" (see Table 7.7 & Appendix G4).

Table 7.7 Respondents' feedbacks on the Bloom's TEO children's drawing evaluation checklist

Checklist Content	Checklist Formatting	Difficulties faced
"Too wordy; Should be simple, straight to the point." *"Too lengthy; Too complicated; Too much description to analyse; Too much repetition and requires to repeat reading in order to understand."*	*"Giving wider columns and lines to write the evidence."* *"Reducing cluster by increasing font size."* *"Quite broad 0 to 5 rating Rating scale too vague; give example per each rating scale"*	*"Need time to digest; need more practice."* *"The process is tedious because the checklist is very comprehensive."* *"The criteria are written similar too, which makes assessing confusing and frustration sometimes."*

The Bloom's TEO is indeed a very comprehensive taxonomy established by a committee of college and university examiners from 1949 to 1953 (Bloom, et. al. 1956). It was later revised by another team of experts (cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists) in 1995 to 2001 led by Anderson and Krathwohl, (2001). Therefore, it did not do justice to simply pilot the TEO with a small sample size of 45 pre-service teachers and make direct modifications. Instead, a full scale implementation of the Bloom's TEO drawing evaluation checklist with 140 respondents indirectly served two purposes:

- to establish a baseline to understand where the taxonomy stand as a potential framework to read children's drawings; and,

- to find out to what extent (if any) recurring pattern of difficulties faced by the respondents occur in using the checklist.

The following section reports on the respondents' performances in reading children's drawings with the Bloom's TEO checklist.

7.7.1 The respondents' performances in reading children's drawings.

About 75% respondents could confidently rate four out of six cognitive criteria: Remember; Understanding; Apply; and Analysis. They are probably thinking skills teachers were familiar with in their teaching practices such as teaching vocabulary ("remember" - testing and getting children to recall, identify and recognise by selecting picture and word matching tasks), classification ("understanding"- by getting children to give examples by sorting, grouping, finding similarities and differences of things), analytical tasks (analysis -teaching of mathematical concepts of parts and whole and thematic approach of teaching individual elements combining to form a theme). Application processes are commonly found in the teaching of life cycles and story sequencing activities. However, the findings indicated some respondents had difficulties with "Evaluate" criterion by detecting "inconsistencies" or "incorrect answers" in the drawings from a teacher's stance (as if marking a worksheet), instead of checking for evidence of the child demonstrating evaluation skill to "critique by judging and detecting inconsistencies and appropriateness…" the respondents were critiquing anomalies found in the drawings:

<u>For wild animals theme</u>:

"Bats come out during day time"

"Koala bear has button on its body"

"There are three rainbows in the sky instead of one."

"Child drew cloud & rainbow with face expressions."

<u>For the water cycle theme:</u>

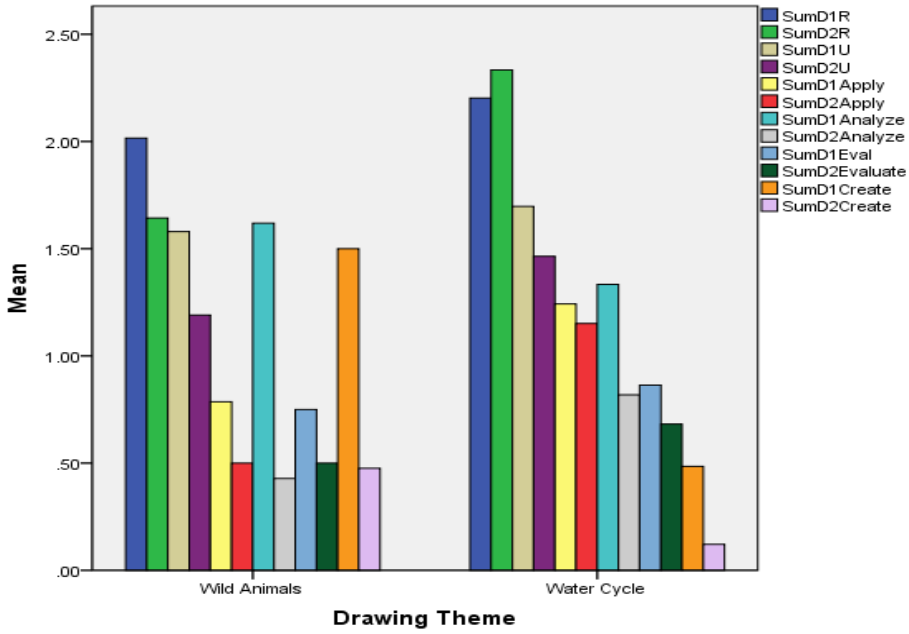
"Fruits on the sea"

"The carrot is out of place; mermaid with one strand of hair"

"Stickman" (not drawn with full-body)

The higher order cognitive processes of "Evaluate" and "Create" may be unfamiliar to the respondents because time spent in teaching factual and conceptual knowledge was at the expense of the former. The teachers' lesson objectives were easily matched at "remember" and "understand" criteria that called for the children to remember largely by identifying and labelling 11 wild animals' names and the four stages of the water cycle. Thus, Figure 7.15 summed up "Remember and Understand" processes were highly promoted in the two distinctive classes in terms of family income backgrounds, children's composition, and thematic content but quite similar in teaching outcomes as far as thinking processes are concerned. Little analytical skill was promoted in the teachings; save for producing the research thematic drawings only than were the children naturally ushered into an analytical process of differentiating, organizing relevant elements to fit into the drawing theme.

Figure 7.15 "Remember" and "Understand" cognitive processes were highly promoted in wild animals and the water cycle lessons



Legend
D1/D2 - Drawing 1 / Drawing 2
R – "Remember"
U – "Understand"
Eval – "Evaluate"

Table 7.8 "Remember" and "understand" criteria case summaries

Drawing Theme		SumD1R	SumD2R	SumD1U	SumD2U
Wild Animals	Mean	2.0159	1.6429	1.5794	1.1905
Water Cycle	Mean	2.2020	2.3333	1.6970	1.4646
Total	Mean	2.0978	1.9467	1.6311	1.3111

Why use the Bloom's TEO when a coding checklist aligned with the lesson's objectives could identify information of learning? According to Biggs & Collis, (1982), Bloom (1956), Bruner (1960), and many other learning theorists academic subjects are taught with two main effects of "content and process" on the student in mind (Biggs & Collis, 1982, p.164). Content are the "facts and concepts" that constitute the subject knowledge. Process refers to "cognitive processes that are induced by a proper understanding and application of the subject" (Biggs & Collis, 1982, p.164). Moreover, Bruner (1960) strongly emphasized the interplay of content and process structure in teaching and learning (Biggs and Collis, 1982). Soundy's and Qiu's (2006/2007) project entitled "Picture power" with American and Chinese kindergartners exploring imagery and language recommended that teachers should coordinate drawing activities that are *thematically related* because "the thinking process behind it is more complex, when children are working on a planned unit of study" (p72). In other words, not only in subject matter per se but in making a drawing there is evidence of an intimate relationship between meaning construction and thinking activity. In addition, Hope (2008, p.15) came up with a list of key uses of drawings as a tool for learning and thinking that could be mapped onto the Bloom's TEO six criteria (see Table 7.9).

Table 7.9 Hope's (2008) key uses of drawings as a tool for learning and thinking mapped to Bloom's TEO (2001)

Hope (2008) Drawing as a tool for learning and thinking	**Bloom's TEO criteria**
Developing understanding Understanding function Developing personal response	**<u>Understand</u>** - by interpreting/classifying with examples of association/placement - by inferring
Clarifying ideas, observations and relationships Establishing patterns Representing abstract concepts Analysing concepts Investigating form	**<u>Analyse</u>** -by differentiating and organizing -by determining a point of view, bias, values, or intent underlying -by differentiating relevant from irrelevant parts
Questioning observations	**<u>Evaluate</u>** - based on criteria and standard
Generating /developing ideas	**<u>Create</u>** -by generating alternate hypothesis

Hope's (2008) rather vague and general listing of thinking processes was made more specific and observable when mapped onto the Bloom's criteria giving it structure and form in guiding teachers' what to look out for in reading drawings. If not it would simply be another high sounding theory of the benefits of drawings inapplicable to classroom practices.

Moving on to discussing coding checklists as an evaluation of children's drawings this is popularly practiced in science education that has a strong curricular intention to promote scientific process skills in young children for example, to infer, predict, and classify (to name a few). But in this study, it had illuminated the flaw of a coding checklist in comparison to the Bloom's TEO. Coding checklists could only assess one-side of the coin, the "content," and misses out on the "process" that constitutes the appropriate way of thinking (scientific process skills) about a

(science) topic. Nevertheless, Table 7.10 shows all potential assessment tools have strengths and limitations.

Table 7.10 Strengths and limitations of the three coding practices

Item Description	Coding Checklist	Bloom's TEO Checklist	Conventional Coding
Content Inference	Moderate inference needed highly dependent on assessor's subject knowledge and setting of lesson objectives that impact on the accurate designing of the coding checklist	Moderate inference needed; Subject to the assessor's understanding of the criteria.	High inference needed. Subject to the assessor's exposure and experience in looking at children's drawings.
Thinking processes	Implied but not directly assessed	Highly assessed; Useful indication of the process skills promoted in a classroom.	Subject to the assessor's knowledge of thinking processes.
Children's spontaneous knowledge	Low in capturing children's spontaneous knowledge outside of the lesson objectives	High in capturing children's spontaneous knowledge by the six cognitive processes	Random capturing of children's spontaneous knowledge – subject to assessor's open-mindedness and insight of its meaningfulness
Inter-rater agreement	Moderate to high inter-rater agreement when coding checklist is accurately –worded in accordance to the lesson objectives.	Moderate to high inter-rater agreement; needs training.	Random inter-rater agreement

Table 7.10 applies to the Bloom's TEO checklist, coding checklists and teachers' conventional coding, that is, coding drawings intuitively and randomly not guided by any framework of reference and commonly practiced by most local teachers. An example of a conventional coding (see Figure 7.16) was a spin off when an impromptu opportunity presented itself in a workshop conducted by the investigator where ten teachers (from diverse teaching backgrounds – preschool, primary, and secondary) and a few parents were given the water cycle drawings to read for information.

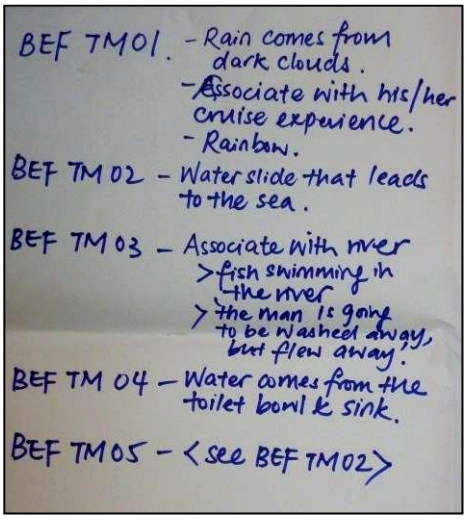


Figure 7.16 Conventional Coding

For respondents first-time applying the Bloom's TEO to read children's drawings most probably, it was better to provide two training sessions covering only three cognitive processes respectively, instead of all six within one session may enhance their performance. So, what are the conditions for reading children's drawings successfully with the Bloom's TEO? It is suggested:

- annotations of children's drawing descriptions must be accounted for;
- clear rating specifications to ensure transparency in rating and inter-rater agreement;
- rating-score must be supported with drawing-evidence; and
- clock in time and practice to read drawings with the Bloom's TEO.

The above requirements are relevant to teachers who choose to teach "content and process" and not either "content" or "process" approach. The discussion here connects back to Component I regarding factors that influenced teachers' teaching decision (see Chapter 4). Whether teachers teach to content-and-process or content only, it is highly influenced by their beliefs and knowledge of what teaching and learning meant to them.

7.8 Conclusion

The Bloom's TEO checklist has proven its potential for translating drawing-information into classroom practices to enhance content-process approach in teaching and learning. Findings of the coding checklists and Bloom's TEO have presented comparable pattern demonstrating more evidence of learning in the pre- than post-lesson drawings. In other words, children's drawings have the potential to function as an informal assessment tool within a unit of study. As an assessment tool they could be flexibly deployed to explore a child's prior knowledge in making pre-lesson drawing and / or finding any change in knowledge by comparing pre- and post-lesson drawings. Moreover, information captured allows a teacher to consider his/her teaching effectiveness in relation to the type of thinking skills promoted in a classroom. In Component I, some respondents commented the importance of noting children's prior knowledge but the pressing need of fulfilling a curricular within a time frame had prevented them to do so. Now the study has found a potential use of the Bloom's TEO as a drawing evaluation checklist for teachers to gather vast information of children's learning (content-process). Besides, drawing as a classroom-based activity can be flexibly carried out with a whole class of children, with individuals or small-group experience. Thus, freeing the teacher's time spent in monitoring responses. In addition, children have the freedom to express their true perspectives with little teacher interference unlike worksheets assessment. Next, drawings also offer teachers visual records of individual child's conceptions and misconceptions that teachers could return to whenever time permits to identify and make the necessary lessons' modifications to address misconceptions accordingly. Newton's (2000) summed up the essence of the study, teachers should not "assume that children's prior knowledge is worthless and should be ignored. The aim is to develop it, revise it, and connect new knowledge with it" (p.200).

The unprecedented approach of reading children's drawings with the Bloom's TEO had elicited a reasonable amount of information and some cognitive processes for teachers to advance it, revise it, and connect with children's prior knowledge. It informed us children's drawings are indeed a potential resource of information teachers could draw upon to inform lesson planning. Of course, taking the respondents' feedback into account the Bloom's TEO drawing evaluation

checklist could be better improved to guide teachers to read drawings from a developmental perspective. Therefore, the investigator hoped to implement the revised children's drawing evaluation checklist by combining the Bloom's TEO with Biggs's and Collis's (1982), Structure of Observed Learning Outcome (SOLO) taxonomy to improve on rating specifications in future research (see Chapter 8 for the revised checklist).

Chapter 8 Discussion

8.1 Introduction

The essence of the study is to consider classroom practices by taking into account "the child's way of viewing things" (Bruner, 1960 cited in Harlen, 2006, p.46; Piaget 1967; Vygotsky, 1962). Children's drawings like play are largely motivated from a child's perspective; as a result, it confounds and intrigues most adults. The research attempts to investigate children's perspectives through their drawings. A child's perspectives lies in his or her prior knowledge and experiences communicated through drawings which I believe may be useful to support classroom practices in lesson planning, activities and evaluation. Activities taught in line with children's interest and made relevant to things they already know, provoke selective attention and retention of the taught material (Goswami, 1998). According to Harlen (2012) understanding develops and children are intrigued when they realize their ideas do not fit all the evidence of the new material taught and they keep wondering about it. This is what makes learning interesting when there is an urge to settle the puzzle in one's mind. Most importantly, according to Harlen (2012), it is not just the new and unexpected that can puzzle children, "the familiar has puzzles in it and these are often the most intriguing to them" (p.46). The investigator had observed Singapore preschool teachers trying to follow children's interests by teaching materials narrowed down to what children were already familiar with but they floundered in expanding their interests and learning. As a result, sometimes lessons were pitched with too little challenge as the concepts were already familiar, or with too much challenge with abstract concepts to the distress of children's prior knowledge.

8.2 Research Component I and the Curriculum Change Connection

The teacher is the most important resource to a class of children for their learning (Qualter, 1996). Askew, et. al. (1997) found a strong relationship between teacher's belief orientation and classroom practices. This observation triggered a journey to investigate what is familiar to children. First of all, a questionnaire survey with 325 Singapore teacher-respondents was carried out to find factors that influenced teachers in deciding when to teach new material. From the results, the three key hierarchically ranked factors were:

1. Teacher's philosophy of teaching and learning;
2. The school curriculum and teachers' obligation; and,
3. Teachers' ability to cope and manage students of different learning abilities.

Under "teacher's philosophy of teaching and learning," there were mixed responses regarding the role of prior knowledge to teaching and learning. The concerns expressed were teaching materials that children already know either "bored" or "broadened" their learning. We know from the works of Biggs (1995) that teachers' views of teaching usually determined how children go about learning and how assessment is executed. This explained the importance of understanding teachers' belief orientation (Askew, et. al.1997). Teachers with insights into the significance of a child's prior knowledge may actively seek to build upon what the child already knows with the "aim of changing misconceptions" (Newton, 2012, p.86). In contrast, a teacher who believes prior knowledge "distracts" or make a learning situation worse may try to suppress its activation in order to proceed with the planned lesson. This study proposed effective teaching strategy by activating and revealing misconceptions through drawings in order for teachers to correct it early and directly to change them for the better (Newton, 2012). Therefore, teachers' belief and philosophy could have impact on raising standards in classroom practices because curriculum change begins with teachers in teaching decisions for moving children's learning on by diagnosing and refuting children's misconceptions (Newton, 2012).

Other research on developing teaching has demonstrated the inter-connection between teachers' philosophy and curriculum change. For example, Alexander (1992) argued that "exhorting teachers to adopt particular practices without a deep understanding of the principles behind these practices does not in itself lead to raised standards" (in Askew, et. al., 1997, p.50). I believe Ertmer's (2005) notion of first-order changes and second-order changes applied here. First-order changes only "adjust (teachers') current practice in an incremental fashion without changing existing structures or beliefs" while second-order change, "confronts teachers' fundamental beliefs and, thus, requires new ways of both seeing and doing things" (p.26). Thus, the study aimed to raise standards in classroom practices (in setting lesson objectives, lesson planning, and evaluation) by engaging teachers in second-order changes. It aims to help teachers to see and do things differently, to use children's drawings as informal assessment "integral to teaching, concerned with helping learning, not with assessing outcomes or labelling children's achievement" (Harlen, 2006, p.10). It is also hoped it can address teachers' confused notions about the role of children's prior knowledge to learning and teaching.

The survey findings also found three hierarchically ranked informal assessment strategies Singapore teachers utilized to find out about children's sufficient/insufficient knowledge.

1. Teacher-initiated question and answer sessions (Q & A; i.e. teacher asks questions, children respond);
2. Observation of children's general and specific behaviours (e.g. body language and facial); and
3. Communication with children (i.e. interactions, discussions, and conversations).

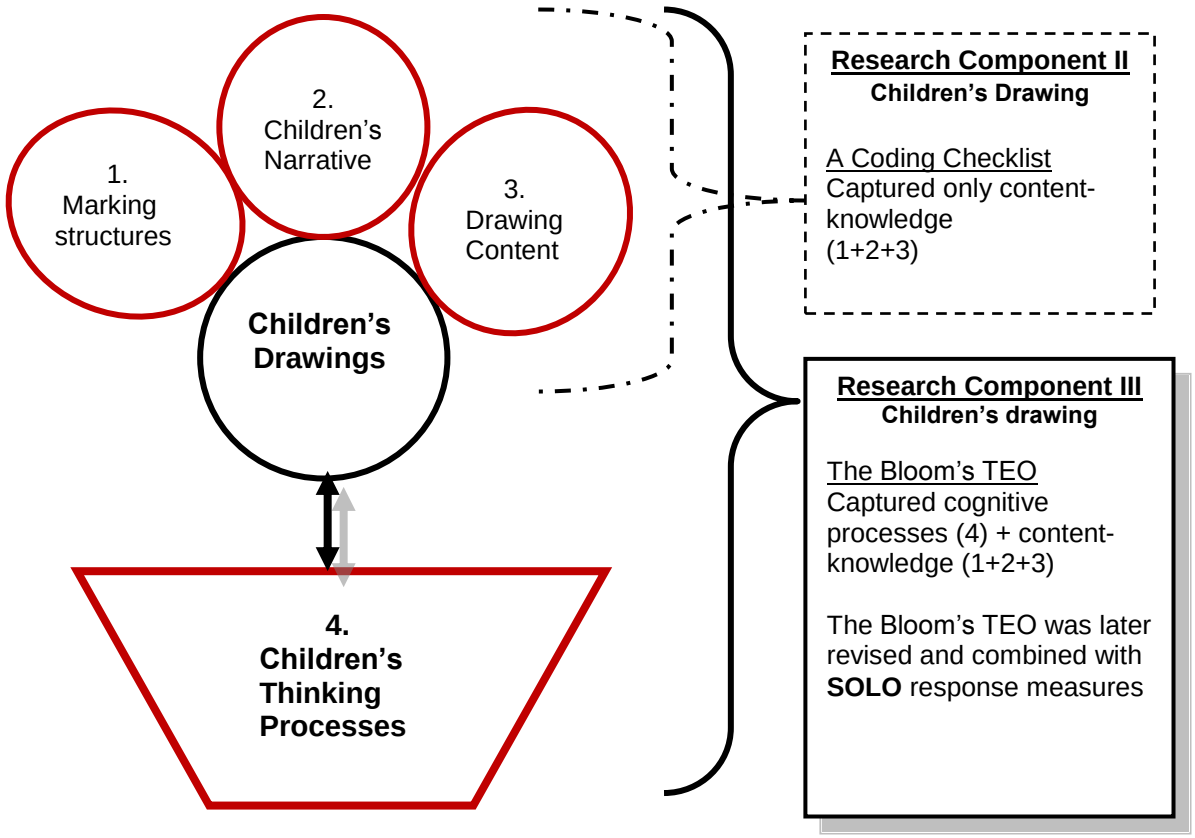
These three most cited strategies are heavily teacher-induced and controlled, laced with "convenience" and "ease" of implementation, and reflecting the needs of a teacher who is struggling to cope with 15 to 20 children in a class. To complement the above strategies, perhaps, children's drawings may be the alternate strategy because children could exercise more control and decision-making to express their viewpoints independently. However, children's drawing as a strategy was ranked

eighth out of tenth in the survey with only 2% (8) teachers recommending it (see Chapter 4). They clearly did not see it as a key strategy for teaching and learning. The teachers commented that evidence of children's knowledge could be found by *"analysing the meaning"* and getting **"***students to talk about their drawings."* Obviously, this set the stage for investigating children's drawings and to develop teachers' understanding of the role they can play in helping learning.

8.3 Three Elements in Children's Drawings that Characterize as Evidence of Learning

Having situated the position of Component I regarding teachers' belief orientation in relation to curriculum change. Research component II and III demonstrated how evidence of learning in children's drawings could bring about educational possibilities for improved classroom practices. First of all, let us review what is in children's visual representations that provided evidence of knowledge in this study. The three elements most theorized and researched into are: firstly, marking-structures (visual syntax of lines, symbols and metaphors). Secondly, drawing content, the construction of meanings known as semantics. Lastly, children's narratives or descriptions of their drawings known as verbalized knowledge, the hallmark of conscious understanding by Goswami (1991). These are summarized in Figure 8.1. These elements were evidentially discussed at length in Chapters 5, 6, and 7 to show how they were processed through thinking (Piaget, 1967; Gardner, 1984; Vygotsky, 1986; Cox, 1992; Matthews, 1999; Willats, 2007; Hope, 2008). Which these researchers failed to operationally identify cognitive processes activated in observable behavioural terms to demonstrate what really goes on when a child draws to think and thinks to draw.

Figure 8.1 Three elements as indicators of thinking and learning in children's drawing



Silver (1978) argued that children "draw before they can write and they associate their drawings with thought even before they can draw anything recognizable" (p. 51cited in Hope, 2008, p. 43). In other words, drawing supports thinking. Analysis of children's drawings without considering a child's thinking processes does not do justice to a child's effort at communicating ideas. Hope (2008) sees children's thinking through drawing in a process of communicating meaning and making decisions about its communication.

> *Drawing is not just a product or container for thought; it is also a process, a journey of thought development. It is the analogical and metaphorical nature of drawing that enables this process thinking to happen.*
> (__ added; Hope, 2008 p.67).

Conventional coding checklists commonly used in science education aligned with lesson's specific objectives could not capture the "journey of thought development" other than content-knowledge informed by children's narratives (see Chapters 5 and 6). However, how could a teacher unfamiliar with children's "analogical and metaphorical thinking" capture the thought process in children's drawings? As a result, the investigator had initiated research Component III with 140 Singapore teacher-respondents to evaluate drawings with a framework based on the Bloom's TEO cognitive criteria to help them to "read" children's drawings alongside a coding checklist.

8.4 Research Component II Children's Drawings as a Resource of Information

Component II consisted of two sets of drawings, wild animals (by fourteen, 6+ year-old children) and the water cycle (by eleven 5+ year-old children). In total, they had produced 25 pre- and 25 post-lesson drawings. Between pre-and post-lesson drawings the class teachers conducted their planned thematic lesson in the respective preschools. The drawing themes selected were part of the preschools' on-going curriculum at the point of research. The wild animals theme's lesson objective was focused on literacy to "*name and spell a list of 11 wild animals*." While the water cycle's objective, "*identify the four stages of water cycle"* was science-literacy focused. Two separate coding checklists aligned with the teachers' lesson objectives were designed to find out the quantity and quality of change in knowledge mapped against the teachers' lesson outcomes and lesson procedures respectively. Results from the coding checklists served two purposes: to compare and contrast by measuring pre- and post-lesson knowledge and to reveal evidence to triangulate with the Bloom's TEO in component III to examine whether children's drawings can be a potential resource of information to inform teachers' practices. First of all, the implications of wild animals' findings are discussed followed by the water cycle.

The coding checklist elicited factual and conceptual knowledge of wild animals as prescribed by the teacher's lesson objectives and lesson procedures. It simply measured within the loop of a prescribed curriculum by feeding back what the teacher had set out to measure from the beginning. It is useful in measuring whether

children have performed in line with a lesson's targets. In other words, the coding checklist as a tool cut to measure within a prescribed curriculum, ignores other information referred as "unique concepts/spontaneous knowledge" the children had communicated beyond the expressed lesson's objectives. Unique concepts are important ideas that children identified with intimately because they are self-motivated and something that children could relate independently but sometimes deemed irrelevant because it is outside of teacher's lesson objectives. The above argument and approach are applied to findings on the water cycle. Table 8.1 and 8.2 summarized information deduced from drawings of the wild animals and the water cycle respectively.

Table 8.1 A summary of wild animals information deduced with a coding checklist

Wild animals coding checklist findings aligned with:		**Findings of spontaneous ideas expressed outside of the lesson's objective**	
Lesson Objectives Name & spell **Factual Knowledge**	Lesson Procedure **Concepts commonly taught and visually represented**	**Pre-lesson Unique Concept**	**Post-lesson Unique Concept**
1. Lion 2. Tiger 3. Elephant 4. Fox 5. Wolf 6. "Rhino" for rhinoceros 7. Monkey 8. Zebra 9. Deer 10. Giraffe 11. Cheetah	Wild animals need food to survive. Wild animals attack each other The sounds of wild animals Wild animals and their feelings Wild animals live in the open & in cages (e.g. in a zoo) Wild animals and their movements (e.g. stalk, pounce)	**The role of a master/leader** in the animals' kingdom **Injured animal** and plaster band aid **Growth and develoment** of animals' festures (e.g. horn) **Family-units** of animals **Creating new hybrid** of animal (e.g. tiger-snake; rhino-tiger-snake) **A map-like** drawing of a zoo	**Sun and heat intensity** faced by animals in the wild (e.g. safari) **Injured animals** and plaster band aid **Growth and changes** of animals in size relations **Personal attitude expressed – Empathy** attributed as feelings of wild animals **Conceptual differentiation** between "looking at" and "looking for"

Out of the 11-word list learning objective the children showed understanding of factual knowledge and spelling competency for *lion* and *giraffe.* For post-lesson drawings they spelt *lion, giraffe, rhino(ceros) and monkey*. Out of a class of 14 only four and two children spelt *rhino* and *monkey* respectively in their post-lesson drawings. *Tiger and wolf* were frequently represented but only one or two children

actually spelt them in their drawings. Both pre-and post-lesson drawings showed the children could spell *lion* and *giraffe* confidently. The study suggests reducing the 11 word-list to four focusing on children's interests in the "wolf, zebra, tiger, and monkey" these were frequently expressed in varied forms and contexts in the drawings (see Chapter 5). However, there is a possibility some children who know the spellings but chose not to spell them in the drawings. On the other hand, research also has shown that most of the time children represent what is meaningful and important to them. Nevertheless, children's drawings offer teachers visual patterns and insights to begin by looking into children's schematic interests. For example, the children seemed to show special interests for the "bat and eagle" and these were frequently represented across the pre-and post-lesson drawings (12 and 9 drawings out of 14 respectively). The drawings also showed the children had little conceptual understandings of the bat and eagle other than representing some characteristic physical features. Perhaps, the teacher can take the children's lead as lesson starting-point by providing more in-depth information of the bat and eagle to make learning relevant. The drawings also revealed the children have other sophisticated interests outside of the commonly taught themes on food; habitat; movements; sounds; and prey and predator of wild animals. At least one child was consistently interested to learn about the physical growth and development of rhino's horn (e.g. abstract time-based concepts of growth and aging processes explored in physiological terms, the differing lengths of rhinos' horn within a family unit and the growth of trees in terms of age and height). Another two children wondered whether an eagle stung by a bee or mosquito needed an aid plaster band just like the way their teacher or parent applied one on them when stung by mosquitoes (e.g. concepts of medical aid for injured animals or veterinary information would be helpful to the child). Table 8.1 shows a list of unique concepts teachers could tap into to enrich curricula planning.

Table 8.2 presented children's interests in the "non-water-cycle" concepts but upon deeper analysis it revealed they were engaged in analogical reasoning to help them to match water movements via water pipes to the water cycle phases of change. Most children fall back on prior experiences of water in bath-room and swimming pool, as a point of reference to grapple with the new water cycle information by finding patterns of similarity and differences to make sense of "precipitation;" "collection;" "evaporation" and "condensation." They are bridging from the

known/familiar to the unknown/unfamiliar (Newton, 2012) known as analogical reasoning (Goswami, 1998). The study found children engaged in analogical reasoning at two levels:

1. Conceptual level
    - E.g. matching man-made water cycle experienced in the bathroom via water pipes to bridge over to the abstract concept of the phases of change in water cycle, and

2. Perceptual level
    - E.g. matching of similar graphic forms e.g. slim triangular spotted tail of a mermaid is mapped and associated with the drawing of a carrot; or multiple horizontal arcs for rainbow are mapped to a multi-tier cruise ship drawn with similar horizontal arcs.

Table 8.2 A summary of the water cycle information deduced with a coding checklist

Water cycle coding checklist findings aligned with:		**Findings on spontaneous ideas expressed outside of taught lesson**	
Lesson Objectives	**Lesson Procedure**		
Identify the stages of water cycle: **Factual Knowledge**	**Concepts commonly taught and visually represented**	**Pre-lesson Unique Concept**	**Post-lesson Unique Concept**
1. Cloud to being 2. Dark clouds 3. Rain/rain drops 4. Lightning 5. Thunder 6. Water collection e.g. river, sea; 7. Sun 8. Wind 9. Landscape	**Precipitation** – rain comes from the clouds **Evaporation** – the sun heats / dries up the water **Condensation** – cold water thus water droplets **Collection** – Rain/water consummates into ocean; sea; and river **Water changes** in state and forms ie. Gas, liquid, solid **Water transportation/** moving from one location to another **Water temperature** - Hot and cold water differentiation	**Water colour coding** • red and blue (hot/cold water tap differentiation **Water sources / utilities** and **Water transportation/** • shower / bathtub / sink / toilet/ drainage pipes • Human tears • Rain, ocean, sea **Water danger** • Drowning, washed away	**Flavored water** • Different fruit flavored-water, chocolate, strawberry, apple **Water sources / utilities** and **Water transportation** • Machine that generates warm, cold, hot water (e.g. jacuzzi) • Piping system **Water danger** 1. Fountain/drown and rescue **Water activities:** • Sailing, Jacuzzi **Water behaviour:** • Cascading; pouring • Falling; whirling

The water cycle drawings revealed the children's conceptual understandings of "precipitation and collection" but not "evaporation and condensation." In addition, it also showed the children had different ideas of where water come from (e.g. water as rain from the clouds, tears from the eyes, treated water via water tap, water from the ocean/sea). It is also observed during teaching supervisions that most Singapore teachers teach with an assumption that the children are already acquainted with the lesson's objectives. This study recommends teachers to find out children's diverse prior knowledge to understand their conceptions and misconceptions as a teaching priority. In practice, teachers must make a concerted effort to "inform" children of

the lesson's objectives directly by saying "children, water comes from many other sources e.g. as tears, treated water… but today's lesson we are talking about water coming from reservoir ... and reaching us as rain…"). It may be a small procedural act but a vital one, not only does it help to clarify the teacher's teaching intention but also managing children's expectation to facilitate conceptual shift between old and new information.

Tables 8.1 and 8.2 present information of children's spontaneous knowledge beyond the teacher's assumptions of what the children know or do not know as reflected in her learning outcomes. When a teacher assesses children's knowledge with a coding checklist she/he may lack insight by not extending children's spontaneous knowledge and interests outside of a lesson's objectives. In other words, a rich resource of children's spontaneous knowledge useful to enriching curricular planning is incapacitated. What is the point of capturing information of children's spontaneous knowledge outside of the specified learning objectives? What is the implication of children's spontaneous knowledge for children's learning, and teachers teaching? Research component I showed most survey teacher-respondents employed "Question and Answer" to intuitively assess children's know-how based on whether children gave the *"right answer" or* "*completely out-of-context,*" or *"vague answers,*" or children were "*unable to answer questions thrown to them,*" as a basis of teaching-judgments. So, the question is, are children's spontaneous ideas considered "*completely out-of-context*" as proposed by some of the Singapore teachers? If children's spontaneous or earlier ideas are considered irrelevant then what is the purpose of teaching? What is the point of collecting additional information of children's unique concepts not measured by the lesson objectives? One of the goals of education is the transference of knowledge (Anderson & Krathwohl, 2001). Perhaps, children's spontaneous concepts are a demonstration of children trying to make sense of what was taught between old and new knowledge, to solve problems, to answer new questions of "what if...it is like..." or to facilitate learning new subject matter that teachers could utilize as ideas for future learning (Mayer and Wittrock, 1996 cited in Anderson & Krathwohl, 2001, p. 63). In other words, children's unique concepts communicated outside of lesson objectives have "transfer" value that emphasized future learning (Sternberg, 1993; Detterman and Mckeough, et. al., 1995; Mayer, 1995; Phye, 1997; Bransford, et. al.,

1999; cited in Anderson & Krathwohl, 2001). According to Bar (1989) the notion of "future learning" is to make learning *relevant* to the learners' prior knowledge to facilitate effective conceptual change and enriching the curriculum in consultation with the learner's know-how. Bar argued that children's unique concepts must be identified by the teachers to enable teachers to design their teaching accordingly, in order to change the children's concept in an appropriate way. If this does not happen, these concepts or prior knowledge being "both logical and self-consistent can stay unchanged, sometimes until older ages" (p.498). This may frustrate a child, hindering moving on if left unidentified and changed. A coding checklist tied strictly to a lesson's objectives may overlook this crucial link. However, a coding checklist has its strengths and limitations in picking up information from children's drawings (see table 8.3).

Table 8.3 Strengths and limitations of a coding checklist to evaluate drawings for information

Strengths	Limitations
1. Made-to-measure according to lesson plan	1. Measure only information specific to the lesson plan
2. Specific, quick and easy to administer (checking presence or absence of knowledge)	2. Missing out on learner's prior/spontaneous knowledge
3. Quantifiable result into percentages or raw data	3. It does not explain the underlying significance of a learner's knowledge
4. Content-knowledge focused, mainly factual and conceptual knowledge	4. Missing out on thinking or process-knowledge
5. Advantageous to strengthening existing curriculum	5. Does not enrich the current curriculum by adding more learner-centred topics and interest areas.

It is attractive because of its "made-to-fit" design that teachers can easily adapt to the specific lesson's outcomes. An alternative tool for reading children's drawings could help teachers to understand the underlying meaning of children's spontaneous knowledge and thinking induced by drawing. Consequently, the Bloom's TEO was employed as an alternative framework in the study to capture evidence of information in children's drawings.

8.5 Component III the Bloom's TEO Framework for Teachers to "Read" Children's Drawings for Information to Inform Teachers' Practices

At least, 140 Singapore teacher-respondents had rated the pre- and post-lesson drawings of wild animals and the water cycle with the Bloom's TEO checklist. In general, the respondents found the Bloom's TEO had great potential in giving them a clear structure for interpreting children's drawings. Some respondents commented that it was a "*powerful*" and "*useful tool*" because it offered "*a structure - know what to look out for;*" "v*ery systematic way;*" "*look out to specific things in the drawing;*" allowed the respondents to "*analyse objectively;*" "*looking at children's drawing from a different perspective;"* and "*analyse the drawing in a greater depth."* Most importantly, using the Bloom's TEO to read children's drawings had filled in the gaps of a coding checklist. Firstly, it had illuminated information by identifying cognitive processes implicit in both teachers' lesson objectives which were mainly targeting at rote learning –"Remember," like to "*name and spell*" wild animals and "*identify*" the stages of water cycle. These were lower order cognitive processes, recognising and recalling in the Bloom's TEO. The lesson content was bordering on "understanding" – "interpret and classify" by giving examples of wild animals and natural elements such as cloud and rain involved in the water cycle. Secondly, the Bloom's TEO helped teachers to recognize the value of "*vague"* answers with respect to "apply" cognitive process. Teachers began to recognize children displaying understanding of the "intent" in analogical reasoning as equally important to giving the "right" answer. In other words, teachers evaluating drawings with the Bloom's TEO were more attentive to "*out-of-context*" answers by trying to understand children's interpretation of the taught materials from a child's perspective. The respondents' comments for children demonstrating application were - *"They know the procedure: open tap – wash hands- water is then discharged into pipe;" "the water will flow in the drain and river thus there is water for showering;*" and "*bathing requires: bathtub, showerhead, water 'on' tap, pipe."* The teachers also gained insight into additional information of children's procedural knowledge in determining the process of people coming and going "*when someone's drowning, there could be others to rescue;" "girl goes to girl toilet and boy goes to*

boy toilet." The respondents realized that a child's ability to differentiate "what-goes-where" is counted as procedural knowledge and not knowledge of insignificant value. For wild animals drawings, some respondents found that a child had demonstrated procedural knowledge about "*turtle lay eggs; turtle comes from eggs;"* and a child's representational procedure of drawing *"the stone tree protruding outward; so monkey could be hanging."* These comments showed the respondents' emerging ability to detect information of a child demonstrating knowledge of "material intention" as opposed to theme-relevant answers only. This has implications for teachers trying to move a child forward in his/her learning. The findings corroborated Madaus, et. al. (1973) notion of the Y-shaped structure of the taxonomy where some of the children demonstrated "general ability" (extensive spontaneous knowledge not measured and recognised within teacher's taught lesson) but captured and measured by "Evaluate" and "Create" processes in the Blooms' TEO (see Chapter 2). Thirdly, the findings also showed 33% respondents had some difficulty identifying Bloom's "Evaluate sub-criterion (b)" whether the child could demonstrate the ability to "*critique by judging and detecting inconsistencies and appropriateness*" in their drawings. Such aspects could be found in children injecting humour in their drawings for example, the girl who giggled at the inconsistencies she had created by affixing a plaster aid band on her eagle's body purportedly stung by a mosquito. In another drawing she included a question mark (?) above the parrot's head to indicate inappropriateness or the absurdity of a parrot eating a diaper (Appendix E17 & E18). A child who could detect inconsistencies or inappropriateness demonstrates a mental capacity of criteria that allow them to judge or critique accordingly. The findings showed 23% respondents (32 teachers) evaluated the wild animals' drawings from a teacher's perspective by checking for anomalies. These respondents critique the anomalies and attributed them as "mistakes" made by the children in their drawings, for example, *"bats come out during day time;" "naming the snake Tom Yam snake"* (Tom yam refers to a Thai cuisine - sour and spicy dish), and "*bear wore a necklace*" as illogical. About 10% teachers evaluated the water cycle drawings by critiquing and speculating the *"child might have encountered drowning before*" to be able to depict a drowning scene. A teacher remarked "*Good thinking skills"* in her evaluation; another commented *"girls have hair, eyes and mouth. Boy only has eyes & mouth;*" and "*the carrot is*

out of place; mermaid with one strand of hair." In the framework "Create" was another process that 10% respondents had some difficulty identifying children who had the reasoning skills to come up with "*alternative hypotheses based on criteria.*" Although, most teacher-respondents could identify acceptable drawing evidence of children demonstrating the creative process, "*plan by designing a procedure*" and "*inventing in drawing a model or product.*" The findings suggested that perhaps, "evaluate sub-criterion part (b)" and "create sub-criterion part (a)" were cognitive skills relatively new and unfamiliar to the respondents, even as adult thinkers. A framework to guide teachers in reading children's drawings was found to serve two purposes. Firstly, it not only illuminated the quality of children's cognitive processes in terms of the Bloom's levels but also the thematic content-knowledge as descriptive evidence of the categories and sub-categories of the Bloom's TEO. Consequently, it also reflected the ability of teachers as adult thinkers in promoting lower or higher order cognitive processes in a classroom because teachers cannot teach what they do not possess or know. Incidentally, the findings also indicated some teachers were naturally predisposed to detecting "errors" in students. This is seen in the way the teachers evaluated the drawings from a teachers' perspective rather than from a child's view point.

At this point, the research findings have presented a persuasive stance that children's drawings do contain information of children's knowledge although, teachers may not recognize it. Moreover, it presented evidence of the principles and conditions of how children learn (e.g. concrete to abstract) and engaged in analogical reasoning at conceptual and perceptual levels. The wild animals and the water cycle drawings findings also presented a general pattern that more knowledge was demonstrated in the pre- than post-lesson drawings. The coding checklist findings showed a negligible gained in knowledge for wild animals' post-lesson drawings, while the water cycle pre- drawings showed slightly more knowledge than the post-lesson drawings. Overall, the 140 Singapore teacher-respondents' ratings showed the children demonstrated more information of knowledge in the pre-lesson drawings for wild animals and water cycle, respectively. In other words, both teachers' lessons had little impact on the children's learning. This is a concern because it suggests that the teaching may actually be limiting thinking opportunities. The research hypothesized that lessons taught not building on children's prior knowledge

may cost children's proximal development in learning consistent with Vygotsky's and many other learning theorists' views. Some of the views expressed by the 61 children in Component I suggested a hint of their naive understanding of the role of prior knowledge played in their learning. They suggested prior knowledge is gained from parents' teaching or reading or from self-readings. They commented: *"Father, mother didn't teach you before;" "I understand always becos' I read."* The findings showed from teachers' perspectives, children's perspectives and theoretical perspectives directing us to the significance of prior knowledge to educational experiences. It is something that commands serious thought and concern.

To find out children's prior knowledge embedded in drawings requires expert knowledge, skills, and guidance by a framework; otherwise, it remained as "pictures" of factual representations only. The information types extracted from drawings is dependent on the framework or techniques as well as the reader's intention. A coding checklist basically extracts information relevant to a lesson objective. The Bloom's TEO checklist extracts both content and cognitive processes information that helps a teacher pitch lesson to promote knowledge-content and thinking competencies because the "two different aspects constituting a logical unity" (Marton, 1981, p.184). Marton argued that "there can be no process without content and there can be no content except in terms of mental activity" (p. 184). In other words, content feeds thinking activity, thus, content and process are a nested whole. However, Furst (1981) pointed out that many psychologists, semanticists, and philosophers have criticised the artificial distinction between process and content; the cognitive and affective domains in the Bloom's TEO. The feeling (emotional or affective) sides of mental life are underrepresented in the taxonomy. But Furst moderated by suggesting the "content" aspects were actually fleshed out in the cognitive process categories and "as specifics in the illustrative test items and questions" (p.446). When applied to children's drawings, the content is fleshed out as features represented and described in the drawings the respondents' cited as evidence to support their ratings for each cognitive criterion. The content/ information elicited can also serve as "objectives and content in curriculum planning" (p. 446). Furst also suggested if the taxonomy were to "include the [*affective*] content as another dimension… is to complicate the business of classification enormously…" ([*affective*] added p.446). In other words, the taxonomy

was successful in keeping the main focus which was the business of cognitive process classification to make the unobservable and covert process of mental states, visible. Wittgenstein (1953) called it the "criteria for a state of mind" (in Furst, 1981, p.442). One could turn to "public evidence (empirical data) and equate the objective with its indicator" (Furst, 1981, p.442). Furst's notion of empirical data, in this study, refers to the descriptions and representations evidenced in the drawings. There were frequent overlaps between and within categories such as between categories of (Understanding) to "*infer"* is overlapped with (Analysis) to "*attribute;"* (Understanding) to "*classify"* is overlapped with (Analysis) "*organize."* This view was shared by some teacher-respondents who commented "*too much repetition*" in the Bloom's TEO. Nonetheless, Bloom acknowledged that "it was not possible to make as clear-out distinctions as one would like" (1956, pp.15, in Furst, 1981, p.447). After all, thinking is a dynamic and complex process. Therefore, the Bloom's TEO being process-oriented, has served a purpose of capturing the processes of thinking induced by drawing because:

> *"... the acquisition of knowledge in a given domain involves not only the mastery of such networks of concepts (with their rules of relationships [concepts, facts, norms, principles]), but also mastery of operations with these, and of particular criteria of truth or validity associated with these concepts, as well as more general criteria of reasoning"*
> ([ ] & _ inserted by investigator; Furst, 1981, p.444).

Indeed, knowledge construction is a complex process of concepts acquisition and mental operations to reason and connect prior knowledge with the new information put forward. Thus, in evaluating children's drawings for knowledge acquisition it is important to capture both concepts and thinking activities involved. Although the Bloom's TEO has its limitation, as far as the study is concerned, it has helped to evaluate knowledge and understanding as manifested in the drawings and has been informed by Vygotsky's and Piaget's theories. In real world research, reiterating Furst (1981) "in the end, it is likely that no single scheme would emerge as an all-inclusive, all-purpose tool" (p.451). At least, with the Bloom's TEO it has offered teachers a framework that allowed teachers to look into the mental activity in addition, to content-knowledge induced by drawing to begin with.

Can we use information of content-knowledge and thinking processes to inform teachers' practices in particular, lesson planning? The Bloom's TEO findings had presented three common thinking processes manifested in the pre-and post-lesson drawings, they are "Remember," "Understand," and "Analyze." In contrast, demonstration of application and creativity was found to be theme-related, although, not theme-dependent. There were more applications seen in the water cycle (55% and 64% in pre-and post-lesson drawings, respectively) in comparison to the wild animals drawings (45 % and 36% in pre-and post-lesson, respectively). (See Chapter 7; Table 7.3). But the wild animals drawings showed more creative models and alternative hypotheses generated (80% and 83% in pre-and post-lesson drawings, respectively) than the water cycle (20% in pre- and 17% in post-lesson drawings, respectively) (see Chapter 7, Table 7.6). These findings showed the Bloom's TEO checklist was reasonably consistent in illuminating the probable cognitive processes related to the dynamics of each drawing themes. Overall, there is still a lack of higher order of evaluative and creative processes promoted in the classrooms. The potential of the Bloom's TEO as a framework to evaluate children's drawing was summed up by some respondents' recurring comments that "*it gives some ideas on what are we to look out*" in "*a systematic manner*." Analysing children's drawings without a guided framework could be a daunting task because children's drawings are loaded with meanings that can be mind-puzzling. Perhaps, this explained why it was not one of the top five preferred techniques indicated by the 325 survey respondents. In other words, teachers do need assistance to make sense of children's drawings.

8.6 The Revised Children's Drawing Evaluation Checklist: The Bloom's TEO-SOLO (Structure of the Observed Learning Outcome) Combined Taxonomies

Generally, the respondents found evaluating children's drawings with Bloom's TEO was helpful, but they also found the checklist needed improvements. They suggested, for example, "*wider columns for writing evidence;*" "*increasing font size;*" "*keep it simple, straight to the point;*" and "*label rating specifically.*" The common opinion was to "*simplify it* (less wordy)" because the "*rating process was tedious, the checklist was very comprehensive.*" So, the investigator noted these points and improved on the Bloom's TEO checklist by combining it with Biggs and Collis (1982) Structure of the Observed Learning Outcome (SOLO), a response measure of a learner's performance in quantitative (how much) and qualitative (how well) aspects (Marton, 1976 in Biggs and Collis, 1982, p.3). The inclusion of SOLO response measure addressed the respondents' suggestion of having a more specific rating scale to guide them in making rating decisions. The aim of SOLO was to offer a "criterion-referenced measure of the quality of learning" (Biggs & Collis, 1982, p.7) which could be matched with the Bloom's TEO. SOLO and the Bloom's TEO shared common goals with a strong consideration of a learner's prior knowledge which fit the study's aim to use drawings to access a child's prior knowledge to inform lesson planning (see Table 8.4).

Table 8.4 SOLO and Bloom's Taxonomies shared goals

Aimed to improve on evaluation of learning in:	
SOLO (1982)	**Bloom's TEO (2001)**
Teacher intentions Learning outcome	To develop learning objectives
Curriculum analysis	To plan instruction
Instructional processes Teacher evaluation	To design assessments

The Bloom's TEO provided the observable descriptive cognitive processes and SOLO complement with its five levels of response to offer a descriptive scale for rating. SOLO's five levels of response measures are approximately matched with the Bloom's TEO cognitive processes to facilitate cross-validation in rating response (see Table 8.5).

Table 8.5 SOLO five levels of response measures matched with Bloom's 6 cognitive processes

Structure of Learning Outcome (SOLO) Five Levels of Response Measures			**Bloom's TEO Six Cognitive Processes**
Response description	**Rating scale**	**Working memory capacity**	
Prestructural	**1**	• Disconnected & irrelevant data	Lack evidence of cognitive processes
Unistructural	**2**	• Takes one to two relevant elements to link the cue and response.	1. **Remember** • Identify & label
Multistructural	**3**	• Takes several or at least three relevant drawing elements to link the cue and response.	2. **Understand** • Interpret • Classify • Infer
Relational	**4**	• Ties up at least four elements in a conceptual scheme showing relationships between elements to form a conceptual scheme.	3. **Apply** • Determine a procedure 4. **Analyse** • Differentiating • Attributing • Organizing
Extended Abstract	**5**	• Takes up all the relevant elements and show their interrelations by introducing ideas beyond the theme & could reason deductively to create a story that was originally not presented.	5. **Evaluate** • Checking based on internal or external criteria • Detecting inconsistencies 6. **Create** • Generate alternate hypotheses • Plan by designing a procedure • Produce by inventing a new model/product

The Bloom's TEO's underlying philosophy perceived teaching as an intentional act. It is concerned with how teachers helped learners achieved teacher's objectives. The "reasoned" aspect is reflected in the teacher's selected lesson objectives. The aim of the framework was to ensure instruction and assessments are aligned with objectives. It complements SOLO taxonomy's philosophy of helping teachers to operationalize tasks demands into hierarchical levels of increasing abstractness for teachers to teach the tasks appropriate to students' capacity as well as to evaluate the "success of the instructional episode" (Biggs & Collis, 1982, p.175). Thus, this study has contributed to the field of art education (children's drawings) and early childhood education (5-6 years old children) by creating a new framework by integrating two unique taxonomies for teachers to evaluate children's drawings from a developmental perspective. There is strong evidence of content-process information embedded in the children's drawings (see Chapters 5, 6 & 7), and the revised SOLO-Bloom's TEO checklist could systematically illuminate the specifics to inform teachers' lesson planning building on what the children already know.

Biggs and Collis (1982) designed SOLO to guide teachers to know at what level they should pitch their teaching is an issue that this study seeks to determine through children's drawings. Accordingly, if most students in the class gave SOLO levels between "unistructural" and "multistructural," then it would not be wise to teach at extended abstract level.

Figure 8.2 SOLO-Bloom within criterion and across criteria measurement-check

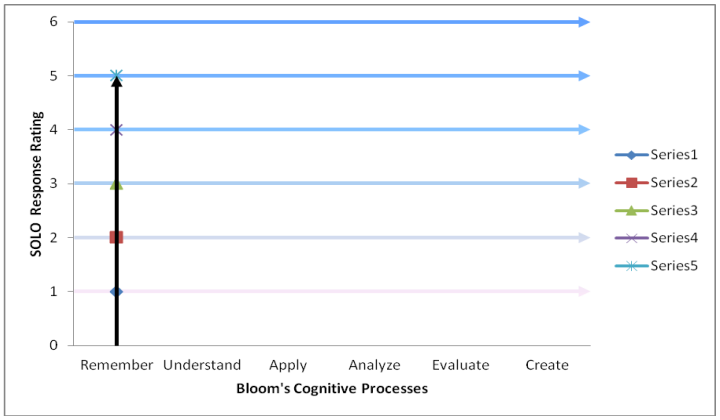
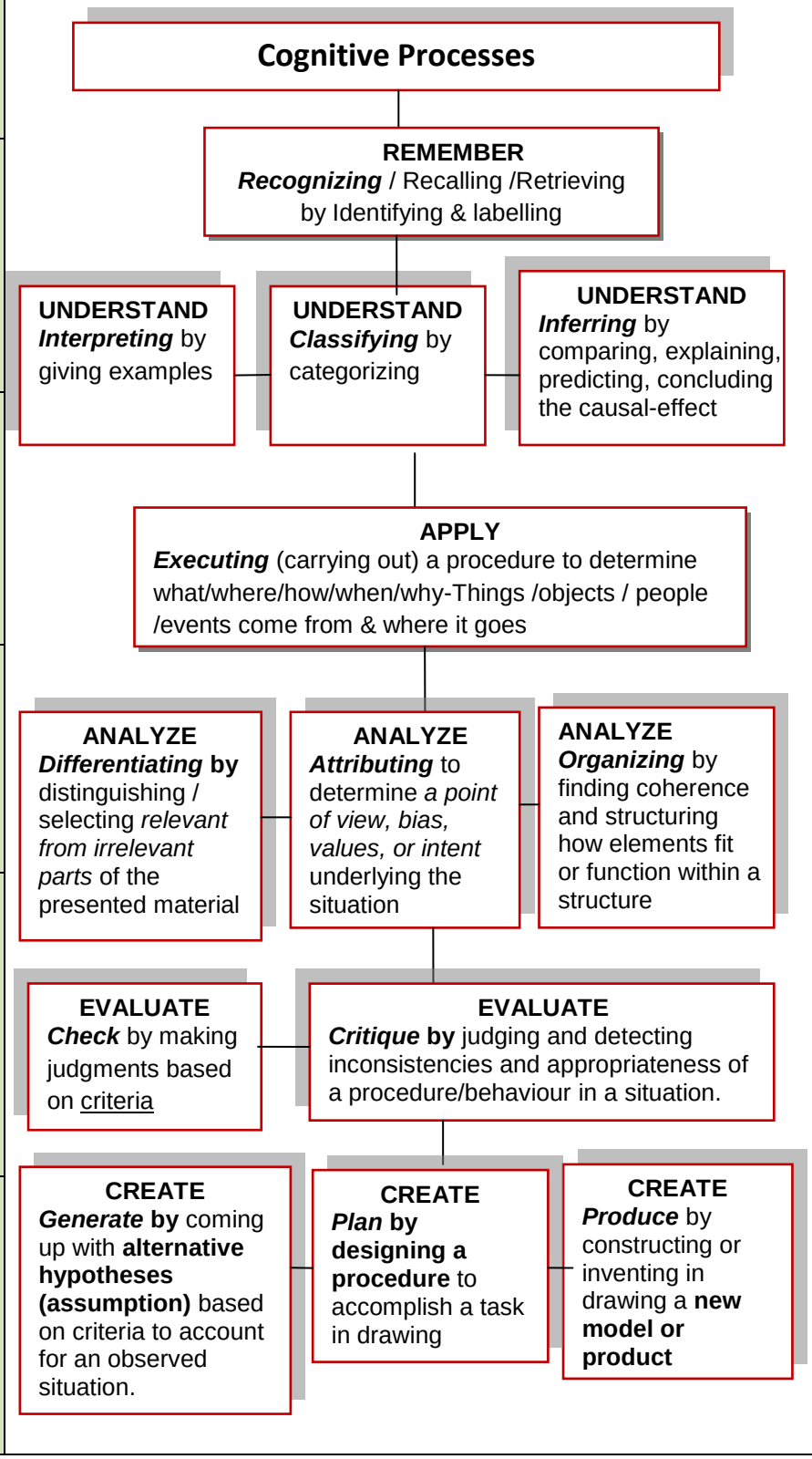


Figure 8.2, represents one of the advantages of combining the SOLO five response ratings and Bloom's six cognitive processes. It made available within criterion (vertical) and across criteria (horizontal) consistency check. For example, within criterion it could range from low-end Understand (point 1 Prestructural) to high-end Understand (point 5 Extended abstract). Across criteria consistency check, for example, when SOLO response rating of four and five are frequently checked by a respondent then most likely it could be matched to Bloom's "Evaluate" and "Create" cognitive processes pegged at SOLO extended abstract capacity, respectively. SOLO counteracts the criticism of the Bloom's TEO for talking about "knowledge of terms or symbols in isolation" by fleshing out the interrelationships of concepts and working knowledge (Pring, 1971 in Furst, 1981, p.447). With the Bloom's TEO if, most children displayed only "'Remember" and "Understand" processes of reasoning, it alerts the teacher to re-consider extending children's thinking skills to the next higher order. The study aims to use information in children's drawings to help teachers pitch teaching at an appropriate level that is not only relevant to children's prior knowledge, but extend it. According to Biggs and Collis (1982) the technique is to "structure up to (but not beyond) one level higher than a student's present performance" (p.172). See Appendix H, the revised Children's Drawing Evaluation checklist. It reduces the Bloom's TEO 23 sub-criteria to 18 because the respondents' found the former too repetitive and tedious to complete. See Figure 8.3 an overview of the Bloom's TEO-SOLO taxonomies integrated revised children's drawing evaluation checklist.

The revised checklist was tested with 18 mainstream preschool teachers and nine had previous experience with the original checklist first introduced to the 140 respondents. The aim was to test for "relatability" (Bassey, 1999) and generalizability with 22 special needs teachers. Similarly, SOLO and the Bloom's TEO were new to most teachers. Therefore, a 60 minutes PowerPoint session (see Appendix H5 SOLO powerpoint slides & H6 special needs children's drawings & the Bloom's TEO slides) were conducted to teach them how to rate 17 high-functioning children's drawings (see Chapters 1and 3). The next section discussed the respondents' views of the revised checklist.

Figure 8.3 An overview of the revised Bloom's TEO-SOLO children's drawing evaluation checklist

Amount of information evaluated with SOLO **Response Rating Scale 1 to 5**	**What to evaluate in children's drawings?** **Bloom's TEO Cognitive Processes**
Select only ONE scale ranging from 1 to 5 and support with evidence in the drawing. **Below is an example of SOLO rating for "Remember" process.**	
1 **Prestructural** Elements identified and labelled are meaningless and irrelevant to the theme. OR No evidence of cognitive skill demonstrated.	
2 **Unistructural** Identify and label at least one to two simple and obvious elements relevant to the theme. X X **2 Elements**	
3 **Multistructural** Identify and label at least three separate elements relevant to the theme. X X X **3 Separate Elements**	
4 **Relational** Identify and label at least four or all related elements by showing relationships in a story-like context presenting a conceptual scheme. X~X~ X~X **4 Relational Elements**	
5 **Extended Abstract** Identify and label at least five or all the related elements and show their interrelations by introducing ideas within and beyond the theme. OUTSIDE IDEAS X~X~X~X~ X **5 Interrelated Elements**	

8.7 Teacher-Respondents' Feedback on the Revised Children's Drawing Evaluation Checklist

The teachers' positive feedback gave evidence the checklist had achieved its aim of guiding teachers to evaluate children's drawings from a developmental perspective with a focus on cognitive processes and content-knowledge to inform teachers' practices in lesson planning. Mainstream and special needs teachers' comments and insights gained from using the revised checklist are cited below:

Mainstream teachers' comments were (see Appendix H3):

> "*It makes you really think of what the child might be thinking."*
>
> *"Understand their thoughts and thinking process."*
>
> *"Learn how well they understand the concept."*
>
> *"Learn how critically the child thinks."*
>
> *"Learn how to extend children's thinking.*"

Special needs teachers' comments were (see Appendix H4)*:*

> *"Yes, it is useful as it really makes you look at the drawing as a mirror of the child's intent and thoughts."*
>
> *"It really makes you think and try to analyse what we might overlooked when looking at child's drawing."*
>
> *"... can apply and refer as guide for lesson planning, intervention, strategies etc. Catering to the individual needs of their students."*
>
> *"It helps break down the analysis of children's drawings into steps; easy to organise thoughts."*

> *"The checklist is very good to help me know how to categorise their thinking; to stir me to promote higher level of learning/thinking; to appreciate the drawings and use them more effectively for their growth."*

Although, it was the teachers' first encounter with the Bloom's TEO they found the revised checklist helped them to "*focus our analysis so that we do not think randomly*" because the "*criteria was specific and structured"* and helped "*analysing in a systematic way.*" The teachers found the evaluation process meaningful with the combined Bloom's TEO-SOLO frameworks, such as "*learning, discovering, exploring and concluding;" "I'm more satisfied now than I did with the first round of checklist;" "it was much better to do compared to the previous one*" because the revised checklist was "*clear and easy to use*" with "*SOLO rating in pictorial*" was helpful. It was noted that "*practice will make me get the hang of it. This is definitely a useful tool for teachers;*" and a sentiment shared by a special needs teacher *"but needs a lot of time to practice and analyse."* However, a few teachers still had difficulties with Evaluate and Create processes which was acceptable because even as adult-thinkers they have yet to attain the highest order of thinking processes.

The teachers' suggested areas of improvement - *"a little less wordy;" "there is some overlap in the answers – repetition; could be simpler;" "have two versions (lengthy & simplified);"* and *"add more illustrations."* The investigator feels that by simplifying the checklist further to be "less wordy" may compromise on clarity and specification of information required as evidence to support the criteria. The issue of "overlapping" could be address by informing the respondents beforehand that there are discreet overlappings with some criteria (e.g. inferring and attributing; classifying and organizing). While adding more illustrations may distract and influence the respondents' evaluations of the drawings. However, the respondents' suggestions of having two different versions of the checklist were noted. Consequently, a whole "class" checklist version was designed for teachers to gain an overview of all children's performance (see Appendix H1). A simplified 3-page individual child checklist was designed (see Appendix H2) while the revised comprehensive checklist served as a reference copy (See Appendix H). These

different versions of the checklists were designed with the aim of meeting teachers' practical needs. The following final part of the discussion investigates the strengths and limitations of the research methodology.

8.8 Strengths and Limitations of the Research Methodology

The study's main characteristic lies in Marton's (1981) notion of "the collective mind" in pooling real world teachers' ideas, conceptions, and beliefs, to describe and analyse children's drawings directed towards "experiential description – phenomenography dealing with conceptual and the experiential" (p. 181 & 196). The open-ended survey questionnaire to understand the 325 teacher-respondents' conceptions and beliefs, and preferred techniques to find out about children's knowledge had provided a wide and inclusive coverage at a specific point in time to look for information out there in naturally occurring clusters (Denscombe, 1998). It gave a representative idea of the phenomenon out there. Marton's (1981) idea of conceptual aspects in phenomenography study was addressed by theoretical frameworks of how children learn and think from a constructivism perspective; study of children's drawings; the adoption of the Bloom's TEO and SOLO taxonomies to describe real classroom practices were coherently accounted for (see Chapters 2 & 7).

Empirical research from going into preschools to collect children's drawings in natural settings made the study vastly relevant to classroom pedagogy. Russell and Watt, et.al., (1990) Science Process and Concept Exploration (S.P.A.C.E) project also found the strategy of pre- and post-drawings a very useful way of measuring primary children's science concepts in a variety of areas. Although, children's pre-lesson drawings may suffice as sources of information to inform teachers' practices but it was more robust to attest the role of drawing by illuminating the extent of information encoded in the pre-and post-lesson drawings in this study. This was supported by Hein & Price's (1994) claim that "the most powerful argument for matched pre/post unit assessments is that they can demonstrate what students know... "(p.14).

8.9 Conclusion: Research Impeding Views of Drawing as a Mode of Investigation

Both drawing themes were dictated by the preschools' curriculum at the point of research had its advantages and disadvantages. For wild animals, the lesson objective was to "name and spell 11 wild animals." This made it hard to control. If the investigator were to dictate the names of the animals or present 11 animal-toy figurines one at a time for the children to draw in a controlled situation, the toy figurines may distract the children to attend to "observables" that may impede spontaneous generation of ideas outside of the 11 animals' words or it may turn into a highly teacher-controlled situation of spell-and-draw task. Drawing as a mode of informal assessment has been challenged by many different views such as: "children draw what they know how to draw… what they feel…what is important to them" (Freeman 1980, p.353). Freeman's argument was "undoubtedly, these contain much truth, but since when has truth-content been any guide to evidential utility?" such formulations actually act as an obstacle to research. These views are indeed, an obstacle to research because there is no one fool-proof assessment tool that could capture what is in a child's mind because thinking is a dynamic process and children's priorities change accordingly. What children had drawn at that moment was a snap-shot of the type of schema that interests the child offering evidence of the child's ability to think within a theme-relevant situation (Athey, 2007). This study has found children's drawings provide eye-opening evidence that informs teachers about children's prior knowledge, thinking processes, unique concepts and perceptions about wild animals and the water cycle outside of a prescribed curriculum. In the case of "the child draws what he knows" Freeman's countered this is because the child "does not know enough to be able to do otherwise" (p. 28). Freeman's argument of a child could only draw what they know was corroborated with findings of most children exploring fairly similar ideas although represented differently for pre-and post-lesson drawings (see Chapters 5 and 6). Who could truly tell what a child knows otherwise, if not represented in drawing or told to an adult in a "Q and A" session? Another research impediment of "a child may not know how to draw" was taken up in research, showing that children are capable of making different decisions about drawing even faced with a limited repertoire of structures

and visual vocabulary when the situation changes (Piaget 1967; Goodnow, 1977; Freeman, 1980; Matthews, 1999; Willats, 2005). In fact, the children in this study had demonstrated sophisticated visual representational strategies capturing ideas of wild animals and the water cycle.

True to a "phenomenography" stance it was significant to simply observe how/what teachers teach and how drawing is used and experienced by children in real classroom situation (Marton, 1981). In other words, the methodology used was directed towards "description, analysis, and understanding of (*classroom)* experiences" in order to find real solutions to solve real classroom practices to support teachers' pedagogy (italics added by investigator; Marton, 1981, p.180). Moreover, Zhao, et. al. (2002) argued that the more foreign a new practice is from existing practice, the less likely it will be adopted and implemented by teachers (in Ertmer, 2005, p.31). The ultimate aim of the study is to improve teachers' pedagogical practices by offering teachers an alternative informal assessment technique that provides the "best opportunity for the children to explore and develop their ideas" in addition, to the respondents' preferred choices of Q & A; observation; and communication with children (Qualter, 1996, p.66). In the case of improving the Bloom's TEO rating approach with the 140 teacher-respondents, perhaps, the investigator could have asked the respondents to analyse the drawings first without the Bloom's TEO evaluation checklist. According to Kagan (1992) to promote a change in beliefs in teachers it is necessary to make teachers' beliefs explicit and to challenge the adequacy of those beliefs by offering opportunities for teachers to "examine, elaborate, and integrate new information" into their existing practice or belief system (p.77 in Ertmer, 2005, p.32). In other words, by getting the teachers to evaluate the drawings first without the evaluation checklist could challenge the adequacy of their low confidence in using drawing as an informal assessment strategy (ranking eighth out of tenth preferred strategies in the survey). Then later introduce the checklist to the teachers to evaluate the drawings may offer opportunities for teachers to elaborate and integrate new information and experiences gained from using the checklist as a technique to evaluate children's learning into their existing belief system supported by different beliefs. Thus, this study may well have presented empirical evidence of the use of children's drawings in showing:

- Children's unique and spontaneous knowledge are potential fresh ideas for curriculum planning for teachers' professional development.

- The principles of how children think and learn, by bridging between concrete to abstract; familiar to unfamiliar in the process of analogical reasoning at conceptual and perceptual levels.

- Visual pattern(s) of a class of children's schematic interests that teachers could always return to consult for information and ideas; and to collaborate with parents to extend and establish continuity in learning between home-school.

- Drawings evaluated with the Bloom's TEO made explicit cognitive processes and knowledge types once unrecognisable to teachers now made identifiable and teachable to mainstream and special needs teachers.

- Drawings once regarded as a common classroom-based activity has proven to have utility value in inducing processes which produce desired mental activity from remembering to creating (Moseley, 2005).

With the above evidence, only then could teachers consider adopting children's drawings as part of their repertoire of informal assessment techniques and to perceive need for change and those changes are not impossible (Ertmer, 2005).

Chapter 9 Conclusion

One of the strengths of the research methodology was its "naturalistic enquiry" with real world value (Robson, 1993). It attempted to address problems arising from the field of art education (reading drawings) and early childhood education (5 and 6 years old) contributing to classroom practices in lesson planning, learning and assessment. How could the value of this research be realized in the real world (Boller, 1980)? It led to tangible and useful ideas of developing a Children's Drawing Evaluation checklist by integrating the Bloom's TEO-SOLO taxonomies to support teachers to read drawings for information to explore educational possibilities. The study has bridged the gap between theories of the excellence of children's drawings and classroom practices. It has helped to transfer expert theoretical knowledge of children's drawings once restricted to researchers, now made accessible to teachers mainly looking at the meanings constructed, thinking processes and children's narratives to identify information of content-knowledge and cognitive processes. There is a likelihood that the revised children's drawing evaluation checklist holds a key in solving teachers' dilemma of not knowing what to look for in children's drawings to become one who knows how best to tap drawings for information once under-utilized for best teachers' practices (Kendrick & Mckay, 2004). In addition, the teacher-respondents and children-participants in this study were certainly most representative of a meaningful population of educators (i.e. preschool educators) than those used in other studies. It is therefore; this study's results and conclusions are the most "generalizable" to real-life educational contexts (Seddon, 1978, p.306).

Learning is a knowledge construction process (Bruner, 1996). Constructivists believe the goal of education is to ensure successful conceptual change by linking new information with a learner's prior knowledge (Song, et. al., 2007; Newton, 2012) resulting in a learner's retention and transfer of learning (Anderson & Krathwohl et. al., 2002). The study described here utilized children's drawings to investigate the learning process and conceptual change in young children (5 to 6

years) by comparing pre- and post-lesson drawings. It aimed to use information read from drawings as a basis for "developing curricula, instructional techniques, and testing techniques" and to offer teachers a tool by integrating the Bloom's TEO-SOLO into a checklist to guide them in reading children's drawing evidentially and objectively (Bloom, et. al., 1956, p.21). The information picked up by the checklist mainly reflected children's spontaneous concepts, prior knowledge related to the lesson's theme as well as some cognitive processes.

The survey with 325 teacher-respondents showed a general consensus that "*prior knowledge is important*" and the comments were - "*it has great influence on children's learning capability and process;*" and "*most concepts/topics are linked to one another students are required to have some prior knowledge before they can go onto the next level (learning a new topic).*" But the survey also presented teachers' helplessness and cursory perception of prior knowledge merely as "*reinforcement," "revision" and "re-visit*" rather than extension of learning. It is important to identify teachers' pedagogical beliefs because they embraced "suppositions, commitments, and ideologies" (Calderhead, 1996 cited in Ertmer, 2005, p.28). Moreover, Pajares (1992) also suggested that there is a "relationship between beliefs and teacher practices, teacher knowledge, and student outcomes" (p.327 cited in Ertmer, 2005, p. 28). Two teachers honestly pointed out that they "*do not know if the children have any prior knowledge unless we execute the lesson*" or "*I will never know how much of prior knowledge the children have...."* bear out the teachers general lack of understanding the role of prior knowledge to children's learning and teachers' teaching, and how to go about eliciting children's prior knowledge to begin with.

Therefore, the investigation hoped to achieve second-order change – "change that confronts teachers' fundamental beliefs and thus, requires new ways of both seeing and doing things" (Ertmer, 2005, p.26). The research question "can information in children's drawings inform teachers' practices?" call for new pedagogical ways of seeing and doing things – to plan lessons in consultation with children's prior knowledge. It was hoped the Bloom's TEO-SOLO children's drawing evaluation checklist designed and used here could help to bridge the gap between beliefs and actual practices by empowering teachers with a framework to

evaluate drawings for content and cognitive activities constructive to lesson planning. A good lesson plan, according to Ebbeck, et. al. (2010):

> *"Is one that extends learning and not merely reinforces what children already know. Extended learning is to add something to it- new idea, some new equipment, suggests a new direction to explore and so on." (p.23)*

Children's drawings contain information of mental activity, spontaneous concepts, prior knowledge, taught concepts, children's conceptions and misconceptions that have lesson-extension possibilities for teachers to explore. Besides, learning theorists suggested that "learning is a product of the interaction between what students are taught and their prior knowledge" (Song, et. al., 2006, p. 29). So far, the study has presented information of children's learning and thinking specific to wild animals and the water-cycle drawings teachers could use to connect with the children's prior knowledge.

Next, will the new practice of reading children's drawings to inform lesson planning be adopted and implemented successfully by the teachers? According to Zhao, et. al. (2002), only when it is closer to teachers' real and existing practice will it be adopted and implemented successfully. Windschitl, (2002) also argued that teachers' decisions are more likely to be guided by familiar images of what is proper and possible in classroom settings. In concurrence, this study embraced familiar sights of a class of young children making thematic drawings in a classroom aligned with the teacher's on-going curricula lesson plan. It suggests a "thinking curriculum" a learning model that is thinking-and-meaning-centered, yet insists on a central place for knowledge and instruction appropriate to young children. Picture-making is appropriate to young children because it is based on constructivist views that children actively interpret and relate learning by linking with prior knowledge/ experience that develops their capacity to think and process information (Resnick & Klopfer, 1989, pp.3-4). According to Bruner (1960) the purpose of education should be to develop in children's minds several different "modes of inquiry" in understanding some deep principles and thinking skills. Bruner (1971) also argued that it is "difficult to get to the limit of children's competence when the teaching is

good" (Bruner 1971, pp. 19-22 cited in George 2004, p.57). Good teaching begins with negotiating a curriculum in consultation with the learner's prior knowledge; a curriculum that is relevant and expands learners' interests and needs (George, 2004). More research attention is needed to find out how to utilize children's drawings in teaching practices to support thinking and learning. There are many theories on the syntax and semantics of children's drawings as systems of rules and procedures, and the construction of meanings respectively. But it lacked practical values that could help teachers to translate information from children's drawings to enrich curriculum planning to extend how children think and learn, and how teachers teach. This study has established evidence of wild animals and the water cycle drawings as loaded with information beyond those measured by the lesson objectives or even recognized by the teachers. Therefore, this study proposes a negotiated curriculum that integrates by building on children's curiosity and schematic interests. This has impact on children's lifelong enthusiasm in learning.

To initiate a negotiated curriculum this study has demonstrated three factors to observe to successfully determine information from children's drawings:

1. The need of an appropriate framework to evaluate drawings objectively;

2. A clear understanding of the framework to know what to look out for in children's drawings; and

3. The assessor's expert knowledge and prior experience of looking at children's drawings.

The information types deduced from the drawings are dependent on the framework employed as well as the assessor's objectives and understanding. Drawings evaluated with a simple coding checklist aligned with the lesson objectives revealed mostly conceptual information of whether the child has met the target of the lesson's objectives. But drawings evaluated with the study's SOLO-Bloom's TEO checklist manifested conceptual and cognitive processes. According to Marton, (1981) content and thinking processes constitute a logical unity; one could not function without another. In support of this, Anderson and Krathwohl (2002) maintained that

there was increasing evidence that "curriculum aligned to knowledge and cognitive processes was superior to other methods of estimating alignment" (pp. 258-259). Drawings are visualized knowledge that made "fundamentally covert, typically tacit, mental processes" explicit (George, 2004, p. 118) because children actively construct understandings that "cannot be expressed through language, even language in narrative format" (Kendrick & Mckay, 2004, p.124). Drawings evaluated with the taxonomies captured the children's spontaneous concepts (naive theories) as part of the learning process that Resnick (1983) postulates is useful for informing teachers how children perceived relationships organized into schemata, to interpret familiar and unfamiliar materials by linking with their prior knowledge. Therefore, the combined taxonomies offer teachers a framework to facilitate perceptions of underlying cognition; otherwise, teachers do not know what to look out for in children's drawings (Anderson & Krathwohl, 2001).

Further research is needed to investigate whether a curriculum extensively planned in consultation with children's prior knowledge inferred from drawings actually support children's learning experience. Next, to investigate children's views and responses to worksheets versus drawing as a follow-up activity to record their learning may add value to the study. Meanwhile, the pedagogical implications of children's drawings as an aid to learning and teaching were immense. For the first time, principles of learning - processes and conditions of how children learn, for example, familiar to unfamiliar, personal to external, specific to general - were visually attested in children's drawings. Drawings provided a visual record of evidence of how children mapped and transferred concepts of familiar with unfamiliar. The drawings also presented children's analogical reasoning was clearly demonstrated at conceptual and perceptual levels.

Notwithstanding, there are many developmental aspects beyond cognitive skills that influenced a child's ability to draw, such as physical skills - fine motor and perceptual-motor, socio-emotional which were not fully explored in this study. There were possibilities that some children may have "limited drawing skills and their interpretation of the problem might have prevented them from making such a full representation of their ideas" of wild animals and the water cycle (Qualter, 1996, p.61). Similarly, whether through drawing or writing or listening to children talk or dramatization it does not represent all possibilities (Qualter, 1996). In other words,

consideration is needed of the limiting possibilities by complementing one mode with another for example, visual representation integrated with a child's verbal descriptions or teacher-child discussion of the represented. Bloom (1956) considered freedom and time to be the most important conditions necessary for the product of synthesis. Generally, drawing offers a child considerable freedom from excessive adult interference to determine his/her own intentions, the materials or elements that go into the final drawing. Besides, drawing could be an individual pursuit or an activity with peers to explore different interpretations and "various schemes of organization" (Bloom, 1956, p.173).

So far, the study has contributed to the broader field of knowledge in that there was information (content and processes) in children's drawings that could inform classroom practices, such as:

1. The psychology of children's drawings – the study manifested the covert cognitive processes with the Bloom's TEO that earlier research had only suggested that some form of mental activity induced by drawing. This was evidentially supported by 140 teacher-respondents who had rated the 50 pre- and post-lesson drawings. For example, the significance of visual humour as an advanced intellectual activity that Matthews (1999) and Hope (2008) had detected in children's drawings could be matched to Bloom's fifth cognitive process "Evaluate." Information of children's cognitive processes had serviceable value to teachers to understand how children think and acquire knowledge for best pedagogical practices.

2. The study had bridged the gap between theory into application by designing the "Children's drawings evaluation checklist (the Bloom's TEO-SOLO)" useful to both researchers and teachers.

3. In early childhood education, it offered an alternative assessment tool by giving structure and form to empower teachers what to look out for in children's drawings from a developmental perspective and to plan lessons to extend children's thinking.

4. The study has opened up educational possibilities by tapping into an under-utilized and under-recognized rich resource of information, children's drawings.

When children's drawings are seen as a piece of "scholarly material" that is intentionally produced as a "compound object," a complex organization of marking-structures, conceptual schemes, domain knowledge across subject matters then most probably it has great potential to create educational possibilities (Schwab, 1973, p.515). It opened a way for the child to enter the "curricular discussion and speak for him/herself" as one of the agents to effect curriculum change and not a passive recipient of a prescribed curriculum (Schwab, 1973, p.515).

9.1 Two Possible Criticisms

On reflecting on the study, there are two possible criticisms which I would like to address. The first relates to the instructions given to the children in the Component II drawing tasks (pre-drawing and post-drawing instructions). The second relates to whether asking the children to do a second drawing so soon after the teacher's lesson and the first drawing produces a significant fatigue effect. Were they too tired to do the task?

To address the first potential criticism a short description of what was said and done when setting the drawing tasks for the "wild animals" and the "water cycle" is reviewed here. On pages 123 and 156 I explained that in line with the teachers' lesson objectives either the researcher or the teacher instructed the children to: *"Draw what you know about wild animals; name and spell them."* The same instruction was given for both the pre-and post-lesson drawing task (see p.123). For the water cycle lesson the children were asked to *"Draw what you know about the water cycle"* (see p. 156). These, of course could be interpreted ambiguously (e.g. does "draw what you know" – mean "draw everything you know" or just "something you know?") Since the aim of the study was to explore the use of children's drawings to capture children's knowledge, understanding, experiences, new ideas,

information and interests relevant to the preschools' selected theme on "wild animals" and the "water cycle," I feel that the instruction given to "draw what you know" set a reasonable expectation for the children. So, was the instruction ambiguous to the children? It is possible but again, when the instructions were given to the two groups of children, they appeared unfazed. They responded positively by getting on with the drawing tasks. They just drew what interested them from their personal interpretations of wild animals and the water cycle. Apparently, to the children there was no issue of ambiguity of instructions because in the first place being asked to draw was a familiar experience to them.

Also, they know what interests them, and after all, drawing is visual play to them where they can create something and make things happen in front of them (Piaget 1967; Vygotsky, 1962). Donaldson (1978) reached a conclusion in her study that:

> When a child interprets what we say to him his interpretation is influenced by at least three things (and the ways in which these interact with each other) - his knowledge of the language, his assessment of what we intend (as indicated by our non-linguistic behaviour) and the manner in which he would represent the physical situation to himself if we were not there at all. (p.69)

Donaldson continued that "certainly they [children] commonly understand us, but surely it is not our words alone that they are understanding – for they may be shown to be relying heavily on cues of other kinds" ([ ] *added* p.72). Therefore, when the instruction was given to "draw what you know" most probably, the children assessed the investigator's and teachers' behaviours and intentions that our expectations were for them to draw what they know about the wild animals and water cycle to the *best* of their ability within the constraint of an A4 size paper, and classroom time and routines ("cues of other kinds" or "physical situation" or known as "salient features" of the environment referred to by Donaldson).

The next criticism related to: If a child fails to include some element in the drawing does that mean they do not know it? Of course, the answer is "No." For the reason that this single drawing is only a snap-shot at this point in time of the child's attention to things in relation to the theme that interests him/her and he/she represents of it in drawing (Donaldson 1978; see Chapter 4 p.117 & Chapter 8 p. 258). Similarly, take an example in a question and answer (Q & A) session. If a child fails to answer fully does that mean the child does not know about it? Firstly, there is no absolute method to uncover a child's "know-it- all" knowledge of something because all methods of assessment have strengths and limitations. This is compounded by the fact that children are also limited by their developing abilities to attend to something long enough to tell us *all* that they know about it. Using Freeman's (1980) argument that the child "does not know enough to be able to do otherwise" (p. 28) it stands to reason that, at least at the point of making a drawing, there is only so much a young child could attend and know enough about something that interests him/her and to represent it. Who could truly tell what a child knows otherwise, if not represented in drawing or told to an adult in a "Q and A" session? Freeman's argument of a child could only draw what they know was corroborated with findings of most children exploring fairly similar ideas although, represented differently for pre-and post-lesson drawings (see Chapters 5 and 6). This argument is fully taken up in Chapter 8 p. 258.

The second criticism relates to fatigue effect. The problem relates to whether or not asking the children to do a second drawing so soon after the teacher's lesson and the first drawing builds in a significant fatigue effect. However, this was discussed in Chapter 5 p.148. The details and annotations evidently show no sign of fatigue effect in the post-lesson drawings (See Appendices E1 – E28) . A possible reason for the lack of fatigue was the children embraced the drawing tasks as interactive play experiences (see Chapter 5 p. 140). Matthews (2002) suggested that drawings are part of children's infrastructural enquiry into the "semiotic possibilities of shapes, marks, actions, sound and colours" (p. 7). In other words, drawings provide exploratory play experiences of marking structures to young children. The pre-and post-drawings provided opportunities for the children to explore different ideas about wild animals (e.g. caged wild animals versus animals in the open [safari]). While the pre-and post drawings of the water cycle allowed the children to

explore the same theme with alternative viewpoints (e.g. man-made versus natural water cycle; see Appendices F1 to F23). When asked to make the second drawing the children welcomed the idea by moving quickly back to their seats, eager to begin, and appeared to be more confident and ready to get on with their drawings. Some of them were already talking aloud to their friends what they would like to draw while grabbing a marker on the table, afraid that their friends may lay their hands on the same coloured marker he/she had wanted. Moreover, the 25 children's eagerness to share their drawings with the investigator and peers was clearly evident; they were cutting into each other's conversations and queueing up to talk with the investigator during the annotation process (discussed in Chapter 1 & [8, p. 227]). Other research studies by Russell and Watt, et.al., (1990) Science Process and Concept Exploration (S.P.A.C.E) project also found the strategy of pre- and post-drawings a very useful way of measuring primary children's science concepts in a variety of areas (see Chapter 8 p. 252). This was supported by Hein & Price's (1994) claim that "the most powerful argument for matched pre/post unit assessments is that they can demonstrate what students know... " (p.14). Therefore, the strategy of a second drawing produced after a lesson could not have been too demanding on the children because nothing is more spontaneous to them than drawing. The child is in control over how much to generate and when to terminate when fatigue sets in (see Chapter 2 p. 58). Once again, I reiterate the above possible criticisms were discussed in Chapters 2, 5, 6, 7, 8 & 9.

9.2 Research Learning Points

The research has generated as many questions as it had answered. For example, future research is required to find out when teachers' beliefs are changed to include children's drawings as one of their preferred strategies, in addition, to Q and A, observations and communication with children (as surveyed) whether it improved children's learning and teacher's teaching at two educational levels. Firstly, at a day-to-day classroom lesson planning and teaching level, and secondly, at a year-plan curriculum level – to investigate how it impacts teaching and learning when information of children's prior knowledge, and schematic interests deduced from

drawings are integrated into the curricula syllabus. The emphasis, of course is to create educational possibilities and not to define the curriculum.

If I were to repeat this study, I would keep the use of children's drawings as the main tool to access children's spontaneous knowledge because of the richness in child-generated information. I would continue to use the revised SOLO-Bloom's TEO drawing evaluation checklist to identify drawing induced cognitive processes in order to further improve on the efficiency, economy and utility (Bloom, 1956) of the checklist to engage wider populations such as special needs teachers and lower primary school teachers (7 to 10 years old children), and parents. Therefore, it is still important to keep an understanding of the factors that influenced teaching decisions for the study to have practical pedagogical value to the teachers. Perhaps, by asking more direct open-ended questions to examine teachers' views on prior knowledge (e.g. teachers' definitions and ideas of where, when, why and how – children's prior knowledge is established) and the challenges faced by teachers in employing children's drawings as an informal assessment tool. The reason is to provide opportunities for teachers to challenge the adequacy of those beliefs and to examine the use of children's drawings from a developmental viewpoint for professional development.

I would keep the methodology of using pre-and post-lesson drawings to elicit information of children's learning (as proven in primary science education assessment), but control the variable by assigning a standardized drawing theme (e.g. Insects) for all children to represent from the different preschools for a more consistent comparison across the population. It is hoped to investigate similarity and differences in the general pattern of content-knowledge (factual and conceptual knowledge of e.g. insects and children's most preferred insect[s]) and elicit key prevailing cognitive processes most promoted in the preschools. Another alternate idea is to come up with three different drawing themes approximately targeting at the different levels of the Bloom's cognitive processes. For example, a creative theme (e.g. draw "aliens from another planet") to investigate whether there is the possibility of theme related induced cognitive processes such as the higher order processes, "Evaluate and Create;" (reminded of the water cycle theme that had induced more application than the wild animals drawings). Besides, it is to test further the validity of the drawing checklist whether it really measures what it is designed to measure.

Another idea, to test the robustness of the revised drawing evaluation checklist in teasing out appropriate cognitive processes by collating drawings from an equal proportion of high functioning special needs and mainstream children (5-6 years old; e.g. 25 special needs and 25 mainstream children). Perhaps, set a standard drawing theme for them to represent in order to compare and contrast patterns of cognitive processes and content-knowledge manifested by the two groups of children. The rationale is to follow-up on the findings of the test-run revised checklist that presented a pattern of special needs children lacking mental capacity to infer and attribute (this aspect was verified with an expressive therapist working with special needs children that they adhered to a "here-and-now" thinking mode). Another consideration is to test the revised checklist with different age groups for example, younger children between two to four years or older primary children between seven to ten years old. Another challenge would be to implement the investigation with parents as the key participants instead of preschool teachers to enhance parents' understanding of the role of drawings in a child's learning and to encourage more home-based drawing activity.

To conclude, Boller (1980) argued that "the main thing about an idea is its practical consequences" and "true ideas are those that we can assimilate, validate, corroborate, and verify. False ideas are those that we cannot" (p.259 & 262). The idea of using information in children's drawings to inform teachers' practices by designing the Bloom's TEO-SOLO drawing evaluation checklist for the study to elicit content-knowledge and cognitive processes embedded in drawings, is a true and tested idea in this study. This idea was consequentially assimilated, validated, corroborated and verified by 158 teachers and 21 special needs teachers who had evaluated drawings with the checklists. The 25 mainstream and 17 high functioning special needs children aged between five and six respectively had produced 84 drawings for verification. The 61children (5 to 6 years), and 325 survey-respondents corroborated by sharing their views on learning and teaching. These were the research participants most representative of a meaningful population of educators and the educated who had experienced in one way or another the practical difference the tested idea had made in their experience:

"*It was really good and a total different experience and perspective over children's drawings;"*
(Special needs teacher, 2012)

"Good. Something that we have never thought of when looking at drawings."
(Mainstream preschool teacher, 2012)

and

"An eye-opener. There are more things than meets the eye in terms of drawing"
(Special needs teacher, 2012)

9.3 Research Study: Talks and Presentations

The investigator had the opportunities to present this research study to various audiences. It was well-received and attracted some interests from teachers, parents and researchers (See Appendices I, I1, I2, and I3).

1. *Professor Robert Levine, a professor of Psychology, California State University, fresno, USA and President of Western Psychological Association email commentary on the investigator's research presentation at the Collingwood college (MCR/SCR) postgraduate talks, Durham University*(See Appendix I).

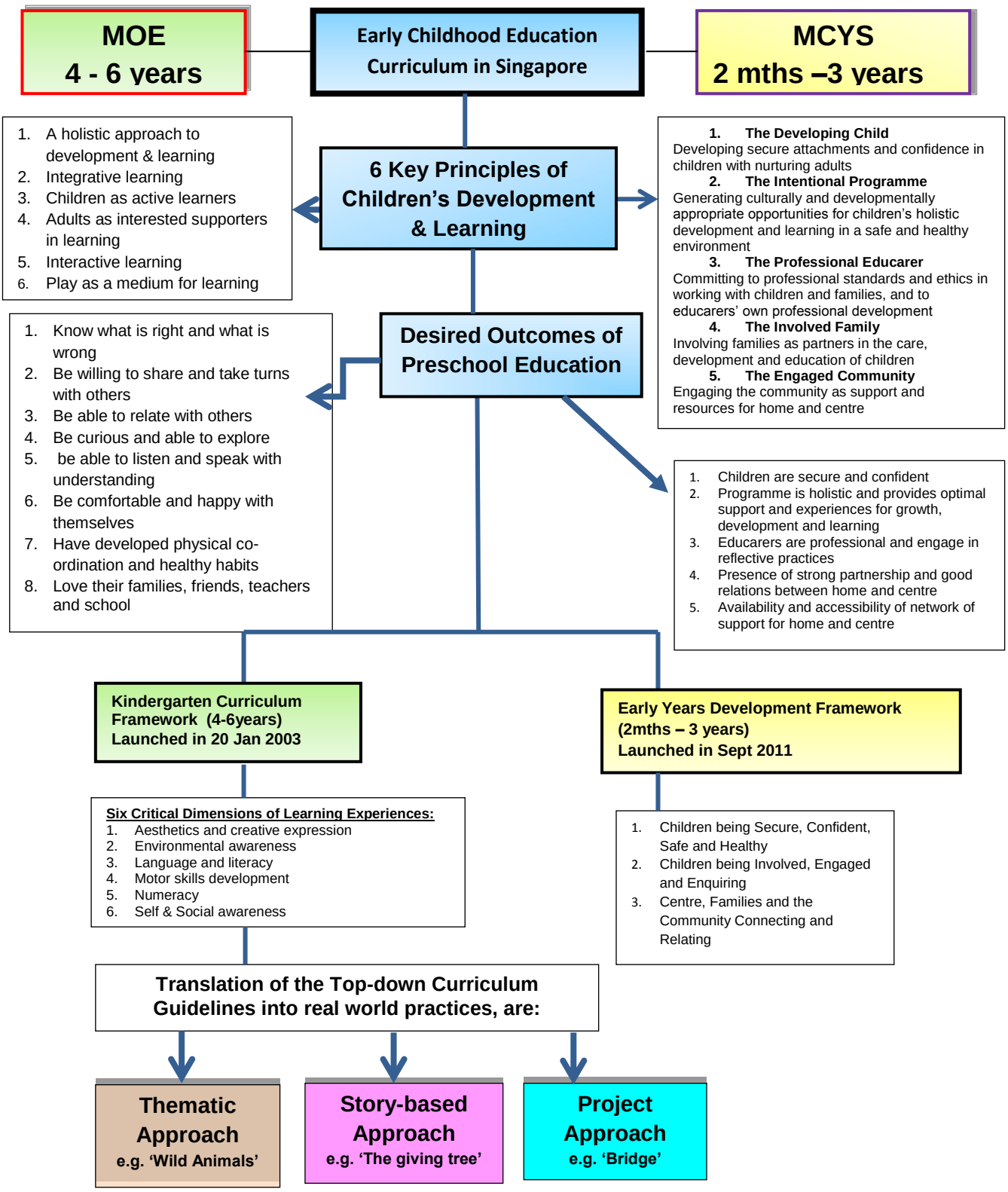
2. *Collingwood College, Middle Common Room/Senior Common Room (MCR/SCR) postgraduate talks, Durham University on 3rd Dec 2012 attended by several professors from the UK and USA and students* (see Appendix I1).

3. *As one of the invited panellists, the idea of "Learning through play" was discussed at the BBC round-table media on 14 Sep 2012* (See Appendix I2).

4. *This study "Can Information from children's drawings be used to inform teaching practice*?" *was presented at the Ministry of Community Youth & Sports, MCYS Child Care Seminar 2011, Sep 29, 2011 concurrent session* (See Appendix I3 evaluation report).

5. *Parents' feedbacks by18 parents from a Singapore preschool had found the workshop on 13 Aug 2011 children's drawings and thinking processes beneficial and informative (*See Appendix I4).

Singapore Preschool Curriculum Framework



References:

Pre-school Curriculum Framework (**Ministry of Education, MOE**, 2003. Singapore)

Early Years Development Framework (**Ministry of Community Development, Youth & Sports, MCYS** 2011. Singapore)

The above diagram summarised the curriculum frameworks initiated by the Ministry of Education (MOE), Singapore for the Kindergarten Curriculum framework (KCF) for 4-6 years and the Ministry of Community Youth and Sports (MCYS), Singapore, Early Years Development Framework (EYDF) for 2 months - 3 years. The aim of these frameworks is to provide a "clear direction for developing educational programme that meets the needs of the children physically, emotionally, socially and cognitively" (Press release EDUN N21-01-01701003, 20 Jan, 2003) and a guide to good practices in pre-school education in Singapore. Relevant to the research is the Kindergarten Curriculum framework because the research focus target age group is 5 - 6 years old children in Kindergarten I and II respectively. How do the preschool curriculum planners and teachers translate the Kindergarten Curriculum framework into classroom practices? It is mainly translated through three approaches listed in hierarchical order:

Thematic Approach

- This is a popular approach with many preschools in Singapore to design their yearly curriculum into themes (e.g. "Water;" "Insects & Creepy crawlies ;") or topics of interests. This approach has been practiced for years prior to the launching of the Kindergarten Curriculum Framework. It is one that gives the teachers the most flexibility to differentiate and to progress in breadth and depth integrated with the six dimensions as the child grows and develops in the preschool.

Figure A1 [1]An example of a thematic approach with the six dimensions

Dimension 1 Language & Literacy

Learning Outcomes

1. To verbalise and acquire vocabulary relating to fish.
2. To be able to construct simple sentences using words related to fish.

Activities

1. Language Experience Approach (LEA) – field trip to neighbourhood fish pet shop to learn more about the different places where fish live and also to understand the shop owner's work.
2. Bring uncooked fish for child to identify and name the different parts of a fish such as "fins", "scales", "gills", "tails" etc.
3. Form simple sentences using given words related to fish.
4. Recite finger play and sing songs that are related to fish.

Dimension 2 Environmental Awareness

Learning Outcomes

1. Use process skills of exploration and observation to learn more about fish.
2. Understand that different fish live in different habitats such as streams, lakes, oceans and ponds etc.

Activities

1. Compare the fish and describe the similarities and difference of various fish (sizes, colours).
2. Observing a real uncooked fish being cooked in a multi-purpose cooker.
3. Role play various roles i.e. Fish shop owner and fishmonger, showing different occupations associated with fish at the dramatic corner.
4. Make a book on fish – children could paste pictures of the fish that they eat every day in the book, bring to class and share why we must eat fish every day.

Dimension 3 Numeracy

Learning Outcomes

1. Compare between various lengths of different fishes.
2. To arrange the fishes in various patterns.

Activities

1. Make use of dried fish to arrange them according to their various measurements.
2. Arrange the fish in AB, ABBA pattern.
3. Match the dominos showing the correct number of fish to the number given.
4. Reinforce their concepts on numbers by practising counting dots in sequence through a Number Board game.

Dimension 4 Self & Social Awareness

Learning Outcomes

1. Express and share their opinions and personal experiences in taking care of fish(feeding).
2. Learn how to play co-operatively with one another through the playing of games together.

Activities

1. Create children's awareness by introducing a healthy diet by eating fish.
2. Describe the favourite pet fish and share with their classmates how to take proper care of their fish in a show-and-tell session.
3. Design their dream aquarium and share their ideas with their friends.
4. Exhibit co-operation as a group through the procedure of assembling a fish tank in the pet corner.

Dimension 5 Aesthetics & Creative Expression

Art & Craft

Learning Outcomes

1. To express experiences using various art media.

Activities

1. To make CD Rom fish craft by using old CDs and other art materials.
2. To make a jellyfish out of paper plates and other art materials.

Music & Movement

Learning Outcomes

1. Create various with fish related songs.

Activities

1. Create music using different musical instruments and make different rhythmic movements following the song, "Fishy Pokey".
2. Children will play a freeze game based on body movements and listening skills.

Dimension 5 Motor Skills Development

Learning Outcomes

1. To develop eye-hand co-ordination and fine motor skills.
2. To develop loco-motor skills through a racing game.

Activities

1. To participate in a "fish and cat" race which encourages loco-motor skills e.g. Running, hopping.
2. To imitate the movements of a fish swimming in the ocean
3. To mould fish figures using clay
4. To recite the rhyme "Goldfish Pets" with finger movements and actions depicted in the rhyme

[1] Courtesy of a student-teacher's contribution

The story-based approach

- This is a rather novel approach currently adopted by preschools to differentiate themselves from the common thematic approach. The idea is to select story books/titles (e.g. The giving tree by Shel Silverstein) and integrate it with the six dimensions for planning learning experiences with an emphasis on language and literacy; phonics; vocabulary; and word recognition/spelling.

The project approach

- This approach is not as prevalent but slowly catching up in the Singapore preschool practices. It may not be the full-blown Reggio Emilia approach involving parents and the community. But a smaller variations of the project approach in terms of scale and involvement; mainly consisting of planned field trips, documentation, observations and extension of children's ideas. Sometimes, it may be implemented monthly or twice or quarterly in a year building on children's ideas and interests.

Singapore preschools strive to offer a developmentally appropriate curriculum guided by the MOE kindergarten curriculum framework operationalised as one of the three approaches. The drawing themes discussed in the research are best viewed with an integrated "thematic" approach and not purely as a subject matter per se (e.g. science, or mathematics). The two themes for research analysis are "wild animals" and the "water cycle" drawings by 5-6years old children. The wild animals' lesson's outcome was for the children to "name and spell the name of 11 animals," focusing on "Language & literacy" dimension. The "Water cycle" theme focused on the "Environmental awareness." Thus, the investigation focuses on thematic curriculum that many preschools and teachers in Singapore could relate with.

References

Ministry of Education (2008) Kindergarten Curriculum Guide.

Early Years Development Framework (Ministry of Community Development, Youth & Sports, MCYS 2011. Singapore)

Bloom's Taxonomy of Educational Objectives (TEO) Drawing Evaluation Checklist **Appendix A1**

NAME: _____ ***MALE/FEMALE**

DRAWING THEME: WILD ANIMALS _____ **Please indicate the DRAWING NO: *BEF ( ) / AFT (06)**

DATE: _____ **Email Add:**_____ **HP:**_____

Instructions:

Please rate the drawing in a scale of:

- ***1 (Least Evidence of knowledge in quantity &/or quality) to 5 (Most Evidence of knowledge in quantity &/or quality)***
- ***Please support your rating with evidence as indicated in the drawing***

Lesson Objectives:

1. ***Children will be able to name and spell a list of wild animals:***
   (Teacher gave the list below of 11 animals when interviewed about objective 1)
   - ***For example: Lion, tiger, elephant, fox, wolf, Rhinoceros, monkey, zebra, deer, giraffe, cheetah***

1 **REMEMBER** *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects *(see definitions below)*		
a. Able to ***identify & label the names of things/objects related to the theme***. E.g. a house, a tree, a bird etc		
b. Able to ***identify & label the names of people related to the theme*** E.g.. this is mummy, daddy, baby etc.		
c. Able to ***identify & label by naming the events related to the theme*** E.g. a birthday celebration, picnic		

REMARKS:

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
***Interpreting* by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material** *(see definitions below)*		
a. *Able to* ***give examples by illustrating how things/objects function or associate*** *with something else related to the narrative/theme in their drawing . E.g. The police car and the ambulance always together when there is an accident.*		
b. *Able to* ***give examples by illustrating how people function or associate*** *with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital*		
c. *Able to* ***give examples by illustrating how actions function or associate*** *with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*		

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
***Classifying* by categorizing/subsuming things/events /people/objects according to functions/ placement etc.** *(see definitions below)*		
d. Able to classify by ***organising/ categorizing things/objects*** **according to functions/ purposes/ placement** etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)		
e. Able to classify by ***organising/categorizing events or experiences according to occasions / causes*** etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc.		
f. Able to classify by ***organising/categorizing people according to functions/gender/relationships/occupation/ placement*** etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.		

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*		
g. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of things/objects*** in their drawing. E.g. the little boy threw the ball so the window broke.		
h. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of events*** in their drawing. E.g. the two children quarrelled because they refused to share the toy.		
i. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of people*** in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car		

REMARKS:

3 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*		
a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why things/objects*** are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.		
b. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why people come from and where they go.*** E.g. mummy comes from the office to pick me up from school and we are going home now.		
c. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why events happen and its outcome***. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.		

REMARKS:

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*		
a. ***Differentiating people/events/ things/objects by distinguishing / selecting relevant from irrelevant parts*** or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.		
b. ***Organizing people/events/ things/objects by finding coherence / structuring how elements fit or function*** within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.		
c. ***Attributing people/events/ things/objects by deconstructing to determine a point of view, bias, values, or intent*** **underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.		

REMARKS:

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*		
a. ***Checking by drawing to determine things*** e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.		
b. ***Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing)*** of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.		

REMARKS:

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*		
a. ***Generate by coming up with alternative hypotheses based on criteria to account*** for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.		
b. ***Plan by designing a procedure to accomplish a task in drawing*** e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.		
c. ***Produce by constructing or inventing in drawing a model or product*** e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-		

REMARKS:

NAME: K. Tan ***MALE/**FEMALE **DRAWING THEME:** WILD ANIMALS **Please indicate the DRAWING NO: *BEF (** 07 **) / AFT (** **)**

DATE: 03/06/11 **Email Add:**kristy.tan@live.com **HP:** 92783800

Instructions:

Please rate the drawing in a scale of:

- ***1 (Least Evidence of knowledge in quantity &/or quality) to 5 (Most Evidence of knowledge in quantity &/or quality)***
- ***Please support your rating with evidence as indicated in the drawing***

Lesson Objectives:

1. ***Children will be able to name and spell a list of wild animals:***
   (Teacher gave the list below of 11 animals when interviewed about objective 1)
   - ***For example: Lion, tiger, elephant, fox, wolf, Rhinoceros, monkey, zebra, deer, giraffe, cheetah***

1 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects *(see definitions below)*		
a. Able to ***identify & label the names of things/objects related to the theme***. E.g. a house, a tree, a bird etc	Child labelled rainbow and able to identify bird, tiger, butterfly, squirrel, snake, lion and tortoise	5
b. Able to ***identify & label the names of people related to the theme*** E.g.. this is mummy, daddy, baby etc.	Not seen in drawing	0
c. Able to ***identify & label by naming the events related to the theme*** E.g. a birthday celebration, picnic	E.g. Butterfly suck the nectar in the dlower and fly away	5

REMARKS:

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
***Interpreting* by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material** *(see definitions below)*		
a. *Able to* ***give examples by illustrating how things/objects function or associate*** *with something else related to the narrative/theme in their drawing . E.g. The police car and the ambulance always together when there is an accident.*	*Eg. Flower to butterfly; squirrel to tree*	*5*
b. *Able to* ***give examples by illustrating how people function or associate*** *with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital*	*Eg buttefly survive by feeding on nectar; tiger is a meat-eater*	*5*
c. *Able to* ***give examples by illustrating how actions function or associate*** *with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*	*Child drew the squirrel wanting to put the nut in the tree*	*5*

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
***Classifying* by categorizing/subsuming things/events /people/objects according to functions/ placement etc.** *(see definitions below)*		
d. Able to classify by ***organising/ categorizing things/objects*** **according to functions/ purposes/ placement** etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)	***Sun, clouds, rainbow (higher level); tree, grass, snake (lower-level)***	*5*
e. Able to classify by ***organising/categorizing events or experiences according to occasions / causes*** etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc.	***Drawing was theme -based***	*5*
f. Able to classify by ***organising/categorizing people according to functions/gender/relationships/occupation/ placement*** etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.	***No humans in drawing***	*0*

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*		
g. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of things/objects*** in their drawing. E.g. the little boy threw the ball so the window broke.	*The squirrel found a nut and wants to put it in the tree trunk*	*5*
h. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of events*** in their drawing. E.g. the two children quarrelled because they refused to share the toy.	*The butterfly got its nectar so it flew away from flower*	*5*
i. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of people*** in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car	*No human s in drawing*	*0*

REMARKS:

3 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*		
a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why things/objects*** are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.	*Butterfly to suck nectar from flower; squirrel took nut from tree*	*5*
b. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why people come from and where they go.*** E.g. mummy comes from the office to pick me up from school and we are going home now.	*No humans in drawing*	*0*
c. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why events happen and its outcome***. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.	*Baby bird is crying for food*	*5*

REMARKS:

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*		
a. ***Differentiating people/events/ things/objects by distinguishing / selecting relevant from irrelevant parts*** or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.	*Birds and squirrel live on trees child able to know land animals*	*5*
b. ***Organizing people/events/ things/objects by finding coherence / structuring how elements fit or function*** within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.	*Wild animals; grass; trees*	*4*
c. ***Attributing people/events/ things/objects by deconstructing to determine a point of view, bias, values, or intent*** **underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.	*Not observed*	*0*

REMARKS:

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**	**MY RATING**
Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*		
a. ***Checking by drawing to determine things*** e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.	*Baby bird crying for mummy*	*2*
b. ***Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing)*** of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.	*Rainbears have eyes, noses, and mouths*	*3*

REMARKS:

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*		
a. ***Generate by coming up with alternative hypotheses based on criteria to account*** for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.	*Butterfly flying away because nectar was taken from flower*	*4*
b. ***Plan by designing a procedure to accomplish a task in drawing*** e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.	*Not observed*	*0*
Produce by constructing or inventing in drawing a model or product e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-	*Rainbows have eyes, noses andmouths*	*3*

REMARKS:

When Should Teachers Teach New Material?

Name: _____ Gender: Male / Female
Age group of students taught e.g. 6-7; 8-9 years _____Date: _____
No. of years of teaching experience: _____Email address: _____

We are interested in how teachers decide when to teach new material to their students. For example, if you perceive that 10% of your students do not understand a topic/theme/concept while 90% of the students are familiar with the topic/theme/concept would you still teach the lesson? Or is the percentage 20% / 80%, or something else?

- There is no right or wrong answers here. In fact, little or no research exists to examine this issue so your views are unique and therefore valuable to us.
- We understand that some of your classes/topics are compulsory and you may teach topics you know the students understand.
- You can answer either hypothetically i.e. in an ideal situation and /or "in practice" i.e. in a real classroom situation the % maybe higher or lower than your ideal.

1. ***Hypothetically in an ideal situation, I would teach a new topic/theme/concept if _____% of the children had insufficient* prior knowledge of the new topic/theme/concept. (*insufficient to achieve the learning objectives of your class)***

   I choose this percentage because
   _____

---

2. **In practice, in a real classroom situation, I would teach a new topic/theme/concept if _____% of the children had *insufficient* prior knowledge* of the new topic/theme/concept.** (**insufficient to achieve the learning objectives of your class)*

   I choose this percentage because

---

3. How do you find out that the students have insufficient knowledge of the topic/ theme/concept?

_____

Would you be willing to be contacted for further clarification? (*Please √) □ YES □ NO
Thank you for taking the time to answer our questions. If you would like to know more about the research, please e-mail [drawrebecca@gmail.com] Doctorate in Education (EdD) candidate with Durham University (UK).

Research Assistant Particulars

Name:Amutha D/O Rangasamy	**NRIC No:**
Address:	
Email Address:	**HP No:**
Occupation:	**No. years of working experience:**
Academic Highest Qualification	**Year**
Professional Highest Qualification	**Year**

Payment

I agree to receive a token payment of $_____ per hour as a research assistant.

Confidentiality Agreement

By signing this binding agreement, I_____ agree not to disclose, share, reproduce or use the research information that is deemed confidential unless required to do so by law.

Name (Print or Type):_____

Signature: _____

Date: _____

Research Assistant Payment Invoice

Name:_____
Date:_____

No	Date	Time Start	Time Ended

I have received the token payment of $_____ for the total no. of research hours_____.

Signature

Research Assistant Payment Invoice

Name:_____
Date:_____

No	Date	Time Start	Time Ended

I have received the token payment of $_____ for the total no. of research hours_____.

Signature

Research Assistant Particulars

Name: Serena Ho Hwee Hwa	**NRIC No:**
Address:	
Email Address:	**HP No:**
Occupation:	**No. years of working experience:**
Academic Highest Qualification	**Year**
Professional Highest Qualification	**Year**

Payment

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Date:_____

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Signature

Research Assistant Payment Invoice

Name:_____
Date:_____

No	Date	Time Start	Time Ended

I have received the token payment of $_____ for the total no. of research hours_____.

Signature

Name of Research Project:

Can Information in Children's Drawings (5-6 years) Inform Teachers' Practices?

Consent Form A: Person-in-Charge of Preschool

I, _____(person-in-charge) of (name/address) preschool _____have read the information above and any questions I have asked have been answered to my satisfaction. I *consent / do not consent my staff _____ (name) to participate in this research, knowing that I can withdraw my staff from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Person-in-charge Name: _____
(Print in block letters please)

Person-in-charge Signature: _____ Date:_____

Investigator's Name: REBECCA CHAN

Investigator's Signature: _____ Date: _____

Name of Research Project:

Can Information in Children's Drawings (5-6 years) Inform Teachers' Practices?

Consent Form B: Teacher Participant

I, _____ teacher of (name/address) preschool _____ have read the information above and any questions I have asked have been answered to my satisfaction. I *agree / do not agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Person-in-charge Name: _____
(Print in block letters please)

Person-in-charge Signature:_____ Date:_____

Investigator's Name: REBECCA CHAN

Investigator's Signature: _____ Date: _____

Name of Research Project: Can Information (5-6 years) in Children's Drawings Inform Teachers' practices?

The purpose of the study is to:

1. To use children's drawings to access their broad knowledge.
2. To guide experienced and novice teachers to evaluate children's drawings with the intention to help teachers to plan and to teach to advance children's knowledge and learning.
3. To guide teachers to make effective lesson planning decisions and to implement meaningful lessons to extend children's knowledge and learning.

Research Procedure

1. There will be 3-4 visits to the preschool.
2. Each visit consists of the following cycle:

- Prior to teacher teaching the new topic/theme the investigator will ask the children to do a pre-lesson drawing next, the investigator observes the teacher teaching the new topic/theme (teacher has to submit her lesson plan) and then ask the children to do a post-lesson drawing. The investigator guides the teacher to evaluate the children's drawings with a designed drawing evaluative tool to help teacher to make effective lesson planning decisions that will help to extend your child's knowledge and learning.

Please return to the investigator

Consent Form C: Child Participant (For parent's consent)

I, _____ (mother/father) of child _____ (child's name) have read the information above. I ***consent / do not consent** my child, to participate in this research. I understand that my child will be interviewed and videotaped in the process of drawing as part of the research documentation purposes. I am also informed that the investigator will observe research ethics as stated below at all times. I fully understand that I can withdraw my child from further participation in the research at any time without consequence.

Research Ethics

Confidentiality is extremely important. Any information or personal details gathered in the course of the study are confidential. No individual will be identified in any publication of the results. All anonymous video recordings will be locked and secured during investigation and after the end of the project will be duly destroyed. If you decide to participate, you are free to withdraw your child from further participation in the research at any time without having to give a reason and without consequence.

Please submit the consent form to the class teacher. Thank you.

Parent's Name: _____HP:_____
(Print in block letters please)
Parent's Signature: _____ Date: _____

Investigator's Name: REBECCA CHAN

Investigator's Signature: _____Date: _____

Research Participant Information

Name of Research Project: Can Information in Children's Drawings (5-6 years) Inform Teachers' Practices?

The purpose of the study is to:

1. To use children's drawings to access their broad knowledge.
2. To guide experienced and novice teachers to evaluate children's drawings with the intention to help teachers to plan and to teach to advance children's knowledge and learning.
3. To guide the teachers to make effective lesson planning decisions and to implement meaningful lessons to extend children's knowledge and learning.

This study is essentially a research student's project conducted by Rebecca Chan, contact number is 90211719 (please feel free to contact at any time).

Research Procedure

1. There will be at least 3-4 visits to the preschool.
2. The first visit must begin at the point when the teacher first begins to teach a new theme/topic/concept and followed up with 3 subsequent visits.
3. Each visit consists of the following cycle: Prior to the teacher teaching the new topic/theme the investigator will ask the children to do a pre-lesson drawing, next, observe the teacher teaching the new topic/theme (teacher has to submit her lesson plans), after the lesson the investigator will ask the children to do a post-lesson drawing, then guide the teacher to evaluate children's drawings with the investigator's designed drawing evaluative tool.
4. For each visit the children will be asked to do drawings with pencils, or markers, and/or colour pencils on A4 papers provided by the investigator.
5. Preschool to provide information on individual child's date of birth and name on each drawing for statistical purposes and accurate computation of child's age.
6. The investigator will be doing video recordings of the children and the drawing processes and conducts interviews with teachers and children.
7. Children's drawings and the teacher's lesson plans will be collated and kept for research purposes by the investigator.
8. Each session will last between 45 - 60 minutes relative to class size and children's enthusiasm and interests in drawing and teacher's lesson implementation.

Research Ethics

Confidentiality is extremely important. Any information or personal details gathered in the course of the study are confidential. No individual will be identified in any publication of the results. All anonymous video recordings will be locked and secured during investigation and after the end of the project will be duly destroyed. If you decide to participate, you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence.

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
33 INSERVICE RESPONDENTS: DTEPO1

No	***HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.**		***In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge**		**How do you find out children's insufficient knowledge?**	**Teaching Exp**
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	30%	The majority of the children will benefit from the lesson meanwhile the rest will require scaffolding (1)	20%	It will require time to teach the children who did not understand the lesson (1)	Through discussions (1) and questions (1)	TEx: 1 yr Stn: 4-5yrs Foo Ngan Fong
2	20%	I feel that this group of children will benefit and learn better from the percentage of 80% who has prior knowledge (2)	80%	I have to follow the curriculum given to us (2)	1. Question (2) 2. Observation (2) 3. Open-ended questions (2) 4. Class discussions(2)	TEx: 5 yrs Stn: 3-4yrs R. Yogeswary
3	50%	It would lighten the teacher's workload in teaching the whole class as compared to focusing on each child as we still have the other half to assist those without prior knowledge (3)	10%	The curriculum is fixed but we have to ensure that lessons taught are much more detailed as compared to the initial objective (3)	By going through the topic briefly beforehand or incidental learning and teacher will prompt the child with more questions to test his/her prior knowledge (3)	TEx:1.5 yrs Stn: 3-4yrs Nurul Ain Bte Abdul Rahim
4	50%	It is the best for the children	10%	The curriculum says so.(4)	Through parents (4), activities/games,(4) observation(4)	TEx: 1yr Stn: 4-5yrs Nursurya Bte Zaini
5	20%	I believe it's my duty as an educator to teach the children a new topic even though the % of children had insufficient prior knowledge is very minimal (5)	20%	I believe it's very important for a teacher to be responsible of the children's knowledge and to educate them as much as I could (5)	When I asked question about the topic some of the children were either quiet or unable to answer correctly (5)	TEx:1.5 yrs Stn:5-6yrs Sarina Bte Radin
6	75%	Even if the balance 25% has the prior knowledge it is still essential to enhance their thinking and make sure their knowledge is learnt thru correct channel or not. If they already know (6)	What ever %	Whether the chn has or do not have prior knowledge of the topics the lesson plan in the curriculum will still have to go ahead (6)	Have basic simple conversation via questioning asses through questioning. Allow chn to talk freely (improper interaction) through their words and knowledge I can know or test them how much they know about a topic etc.(6)	TEx:18m -3.5 yrs Stn:<2yrs Jane Lim Lay Poh

7	60%	At least half of the class knows or understands the topic/theme small group learning can be conducted and revisions or peer learning can be done later or after the topic. (7)	80%	Our curriculum is set by theme and daily theme are new lessons and concepts to learn (7)	Through play and interaction with children (7)	TEx:4yrs Stn:2.5-3.5yrs Estee Gwee
8	30%	I feel that any lower than 30% for a class of 20 children I prefer to introduce the children to peer teaching as I would want the rest to practice what they have learnt by teaching. If the percentage is 30% than I may need to reinforce the concept myself(8)	95%	Being in a position to carry out the given curriculum puts me in a place where I do not have much options to consider about the prior knowledge of the children (8)	I usually introduce the topic by starting a discussion based on the pictures or other material related to the lesson. I will be able to judge their knowledge via their answers (8)	TEx:4 yrs Stn:5-6yrs Kahyathiri d/o Uthrapathi
9	NIL	Firstly as a teacher it is your duty to teach them	60%	Firstly I have no choice because it is in the curriculum but before hand I have to do some research on the topic/theme/concept to make the class understand (to make it interesting)(9)	If after explaining to the students so many times but they still don't understand (9)	TEx:10 yrs Stn:3-6yrs Fauziahton Aziz
10	20%	Knowledge is important child should not be deprived of learning. But I need to strike a balance with the rest of the children who has already some knowledge (10)	NIL	Curriculum/theme/ topics are pre-determined by school requirement would need to cover topic even if children has prior knowledge (10)	Open discussion and the children's conversations & sharings (10)	TEx:1.5 yrs Stn:5-6yrs Jane Yit
11	20%	Every child deserves an equal opportunity to learn and acquire new knowledge. If creative ways of teaching are injected in class even the 80% will have the opportunity to gain knowledge in different angles (11)	20%	The teacher has the freedom to choose and decide depending on the appropriateness of the situation	• By asking them questions (11) • By asking them to describe their experiences (11) • By conducting hands on projects or field trips (11)	TEx:3 yrs Stn:6-7yrs Lee Heok Lina
12	10%	If majority of the children were familiar with the topic/theme/concept, then I can move on to introduce more topics/themes/concept to them(12)	20%	I can teach the 20% of children with the theme/topic/concept while the remaining 80% could take the lesson as a revision (12)	When they were not able to answer the questions posed to them. (12) When they were not able to apprehend and give a blank look (12)	TEx:8 yrs Stn:3-4yrs Anonymous

13	50%	Advantage: able to push weaker children to catch up with the stronger ones able to challenge them. Disadvantage: pace of teaching has to vary with the different levels of children(13)	50%	Advantage: children with prior knowledge will be able to guide weaker children Disadvantage: activities planned will require levels from and above rather than starting of with a higher level (13)	Asking questions (13) Doing activities (13)	TEx:2 yrs Stn:1-5yrs Trixie
14	10%	I feel that no child should be deprived of learning something new. It depends on how the teacher research and carries out the topic for the 90% to absorb new information about a familiar topic (14)	NIL	NIL	1. They are excited when the topic is taught (14) 2. They ask questions (14) 3. They listen attentively (14) 4. They cannot answer questions asked when the topic is first introduced to them.(14)	Preservice teacher Pam Chua
15	80%	I can explore further with regards to the new concept through exploration and experimentation(15)	80%	According to the curriculum set and child's needs (15)	Through discussions, observations to get to know child's prior knowledge (15)	TEx:NIL Stn:NIL Ardaleena Md Sanip
16	20%	To me all children need to know what is being taught. As a teacher, we have to find strategies to assure that all children get/know what the new topic is being taught (16)	50%	We can share or discuss of a topic. Example half a class know they can teach their friends (the other half) so that they more able to learn from one another (16)	It is when they could not answer any questions that was post to them; they could not relate any experiences/concrete things to explain that she/he knows (16)	TEx:5 yrs Stn: 5-6 yrs Siti Nur Zuhaida Aron
17	70%	I like the idea of teaching children new materials when they are still at that raw stage (17). Everyone will be introduced to that concept/theme at the same time and it's easier for me to gauge and 'measure' them in terms of their ability to absorb knowledge. The other 30% who already has prior knowledge is necessary because when questions are raised by me, this 30% could help to answer the questions. They also act as motivators to the 70%(17)	70-80%	It is actually like that. The class that I happen to teach in 2010 and currently 2011 the children have never been to preschool before so everything seems new to them. Teaching them may take longer time but it is good to see them grasping knowledge at the end of 2 weeks per theme.	It is when questions were projected to students during large group discussion but the children were not able to reply me in accordance.(17) Failure to reply could be in the form: - Blank stares (17) - Reply me anyhow - Reply me wrongly - Reply me correctly but only basic answers	TEx:3-5 yrs Stn:4-5yrs Noor Rashiqah Bte Md Yatim

18	60%	I would want to make sure my time is well spent with the children. The rest of the 40% would help to support my teaching and contribute ideas they may also able to show good example to the rest (18)	10%	I have to make sure everyone in my class understand my lesson. However, my pace of teaching will be faster and only main points or ideas are covered (18)	By asking questions (18)	TEx:10 yrs Stn:5-6 yrs Kwan Lai Pheng
19	10%	Even if there are only small percentage of children who do not have sufficient prior knowledge I would still teach them.(19)	10%	It is the same reason as the above I teach not because of getting a few children to understand but my main objective is to let each child has the opportunity and exposure to the new topic (19)	1. I would ask them questions like for example: a. Have you seen this material? b. Do you have any knowledge about this topic? 2. Through the children's responses I could roughly gauge their knowledge and experiences (19)	TEx:9 yrs Stn:4-6yrs Siti Hajar Binte Abd Hamid
20	80%	To me it is appropriate. This is because at least 20% of the children had prior knowledge for class participation purposes. As such the 80% of the children who has insufficient prior knowledge can tap on other children's knowledge. In addition I will add (e.g. concept) that all the children does not know yet. Overall, I am trying to inculcate an environment whereby they learn together and from one another.(20)	30%	Most of the children are already over-exposed to certain themes given are sometimes repetitive like the childcare centre I am working in. For example the themes on Transportation, Myself, Places and People around me. In addition, I observed that even K2 children are taught on what they already know when they were in N2 & K1. This trend, I find it worrisome.	1. They kept quiet most of the time, and when given opportunities to find out more they looked blur (20) 2. Inappropriate answers that cannot be related to the theme/topic/concept (20) 3. When questioned further, unable to answer(20)	TEx:20 mths Stn:5-6 yrs Nurul Badariah Binte Zainal Alam
21	1%	I think all children should learn, I will still teach even tho a child has no insufficient prior knowledge. (21)	1%	I want them to learn new thing and it is also in our curriculum (21)	When I asked questions about the topic and no one answer. When I showed them picture on that topic and no one seem interested (21)	TEx:2yrs Stn 3-4 yrs Sal Hoe
22	50%	It is fair to teach a new topic as half the class do not have the prior knowledge (22). Furthermore, the other half who had acquired the knowledge can help to impart it to their classmate (22).	NIL	I think no matter what percentage the teacher will need to teach a new topic in order to meet the target date set for curriculum.(22)	Through doing simple worksheet to find out whether the children have insufficient knowledge of a topic. (22)	TEx:NIL Stn:NIL Anonymous

23	50%	It would be better if the children learn through peer learning. Children tend to be more receptive when they are learning with their friends. The children with prior knowledge can lead in discussion (23)	80%	If at least half or more of the class had prior knowledge of the topic, they tend to get bored and distracted. This in turn would disrupt the lesson if the children get fidgety and bored as they already knew what was being taught.	By asking open ended question regarding the topic (23)	TEx: 4-6 YRS Stn:2yrs Anonymous
24	50%	I would prefer if attend that 50% can answer some of the question that I ask. It would be more difficult if they all totally don't get what I'm talking about.(24)	80%	I would be forced to because of centre's expectations. I also believe that with that 20% whom have prior knowledge I can still manage with their help (24)	When asked questions, they do not respond & talk. (24)	TEx:3yrs Stn: 18mths -2 yrs; 5 &v6yrs Sangeetha
25	30%	Young children are excited to learn new things.(25) I will be happy if they able to answer my simple questions (25). As a teacher I still have to teach although only 10% of the children had insufficient prior knowledge.(25)	10%	I've no choice as I've to follow the guided curriculum to teach daily (25)	Through observations not able to answer or do simple task (25).	TEx:8.5yrs Stn: 5 & 6 Yrs Sulasteri Binte Sakiman
26	85%	The balance of 15% of the children would be sharing their knowledge in class and even in their peer groups, exchanging knowledge (26)	90%	Topics covered in the curriculum should be taught in class, even it can be an old or taught topic(s). To me it is a reinforcement (26)	Open-ended questions will be asked as an introduction of a specific topic. Depending on the answers given I would be able to find out if the children know anything (prior knowledge about the topic in particular)(26)	TEx:1.5yrs Stn:2-4 yrs Kirishnakumari
27	30%	70% of other children will participate and help the 30% of the children to understand by doing some discussion and group work(27)	80%	I have to follow the curriculum and got no other choice.(27)	We need <u>to observe</u> and ask question that related to the lesson and give ample time for them to think (27)	TEx:4 yrs Stn:4 & 5yrs Anonymous
28	30%	70% of those who are familiar with the topic can "share" their information with the 30% of the children (28)	NIL	If the topic/theme/concept are within the curriculum we have to teach the children (28)	I would ask questions show them theme related pictures or have group discussion etc.(28)	TEx:3yrs Stn: 5-7yrs Veron Chee
29	30%	I believe children would be able to grasp a new concept or acquire new knowledge better with prior background (29) and also	90%	I have to follow the directions and theme as provided from the management level (29)	By asking questions about what they know, seen or heard (29)	TEx:2yrs Stn:5-6yrs Phyllicia Chew

		accept the fact that there will be some children who will be slower or more disadvantaged and will not be able to catch up as fast as the rest.(29)				
30	25%	There is still room for exploration and new topic/theme/concept to existing topic/theme/concept	50%	The curriculum has been designed beforehand and there is no room for improvement (30)	After several reinforcements the children could not apply to my examples that were given.(30)	TEx:4yrs Stn:4yrs Shirley
31	50%	If there are only very few children who do not have knowledge and the majority of children have to revisit something which they already knew those who know will not find challenge and might be bored	NIL	I supposed it's not the teacher's choice. It appears that the current circumstance doesn't allow the teacher to decide because the curriculum is full and teachers have to rush to complete it. This is what I'v ebeen hearing from classmates (31)	Ask relevant questions (31)	
32	10%	The 90% will lead the way for the 10% in another way, the 10% will pick up the concept taught with time and practice. (32)	10%	Same answer as above but have to do within the time given from the school plus the amount of work load. (32)	During Q & A (32) or/and observing behaviour while teaching (32)	TEx:8 yrs Stn: 2-6 yrs Sharon Grace
33	50%	If in a class of children half of them have no prior knowledge of a subject then it would be good to introduce a new concept or subject. As for the other half who is aware of the topic, it's good to refresh their memory (33).	5%	I do not wish for even if its' just a single kid to not have the opportunity to learn something new just because the other children already have the knowledge (33)	I think by asking questions would be a good way. By asking thoughtful, meaningful questions individually and in a group. (33)	TEx:4yrs Stn:4yrs MALE Jay Baskaran

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
33 INSERVICE RESPONDENTS: BSC04

HYPOTHETICALLY in an ideal situation, I would teach a new topic/theme/concept if___% of the children had insufficient knowledge			IN PRACTICE in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had insufficient knowledge		How do you find out about children's insufficient knowledge?	Teaching Experience
Q1 Reasons Given:			Q2 Reasons Given:		Q3 Reasons Given:	
1.	1%	I feel that all children should be given the opportunity to learn everything that is taught in school they pay for the fees, hence it is the educator's job to ensure that they deliver the theme/concepts to the children fully. Give them 100% (HYPO)	10%	Time constraint (REAL)	Through the K-W-L map e.g. (what I know about sea creatures map) as well as daily observations of the children	TEx: 3-4 yrs Stn: 6-7 yrs Koh Wai Ling Priscilla
2	100 %	I wanted all children to learn in the same pace (HYPO)	0%	I will just teach according to what is supposed to be taught that week. Rushing for time (REAL)	NIL	TEx: 8 yrs Stn: 5-6yr
3	5%	As early childhood educators we should try to achieve the highest percentage for children to educated all the children in the class with prior knowledge of the new topic. (HYPO)	20%	I would try to focus on the larger percentage to teach a higher level of knowledge in the topic during whole group lesson. Try to do guided teaching in small groups for the smaller percentage to help build up their prior knowledge (REAL)	Through observations, LEA approach and discussions with individual child or group of children	TEx: 5 yrs Stn: 3-4yrs Michelle Chong
4	10 %	We should not left any children behind but at the same time we need to move on. I would do some introduction/revision first hoping that the few will be able to catch up, and start new topic will slower pace. (HYPO)	15%	In real classroom situation we do have schedule syllabus to complete, 15% at 3-4 children in my class – I think it is fair enough. Same thing applied- revise, start slow and may be rounding up those who are slower for group discussion during free time ti check on their understanding (REAL)	If the child does not response to your teaching, not interested, has puzzled expression on his/her face, answer your question completely out of context, find difficulty in completing worksheet or follow up activities	TEx: 5 yr Stn: 4-5 yrs Anita Chan

5	100 %	As a teacher I will have to introduce new topics to children whether they have prior knowledge as I needed to let every child have equal opportunities to learn and gain new knowledge through exploration (HYPO)	100 %	In a real classroom situation whether is play-based, project-based or thematic approach there is a need for teachers to let children be exposed to new things. (REAL)	Through daily observation and assessment of chn in the class we can identify whether chn had acquire knowledge. OR when interacting with chn during circle time, we will be able to know if they have any prior knowledge and the content/concepts	TEx: 10 yrs Stn: 5-6 yrs Anonymous
6	50 %	Most of the time we are teaching children something new to them. It is up to the teacher to provide them with the knowledge (HYPO)	50%	-	Sometimes during lessons it is obvious that the child has insufficient knowledge.. I will then provide more one on one time to help the child thru the topic/theme we're doing.	TEx:6 yrs Stn: 2-3/4-5 yrs Grace
7	100 %)	Even if nobody had any prior knowledge of a new topic. I will still teach my class. (HYPO)	100 %	As a teacher my responsibility is to impart knowledge, even if there is only one child in my class. (REAL)	• Through daily observation and interaction with chn as well as through formal assessment tools	TEx: 10+ yrs Stn:5-6 yrs Gim Yian
8	-	NIL (HYPO)	20%	My center's curriculum is designed and implemented through observation. We observed a group of children to find out their interest and use the data to carry out activities (REAL)	• Through observation • Children's work • Communication with chn and their parents	TEx:1.5 yrs Stn:4-6 yrs Lam Xinli
9	40 %	In the situation listed above I would continue to teach the particular topic because 10% is very little and I would stay back to guide these weaker students; conduct extra lessons for them if necessary (HYPO)	NIL	NIL	-through observation -Parent teacher meeting -Through lessons, while interactive learning	TEx:8 yrs Stn: 18mthns- 6 yrs Jeanne
10	10 %	I believe in education for every child and that they deserve a fair chance to learn (HYPO)	30%	Realistically, it may be very difficult to justify teaching new materials to children less than 30% with insufficient prior knowledge. (REAL)	Through: 1. Observations 2. Formal assessments such as spelling 3. Informal assessments such as questioning	TEx: 1+ y Stn: toddlers Tan Seow Wei

11	75 %	If ¾ of the class are not able to understand the topic/theme/concept, there is no point and it is unfair to those children. So why not teach another topic and then go back to the original topic when I feel more than 75 or 80% of the children are ready for it. (HYPO)	75%	Of the above same reason. But if also depends whether I can teach a new topic I need to check with the principal/management/parent for their opinion as well. (REAL)	• Through Q & A • Conversations	TEx: 10 yrs Stn:5-7 yrs Yen Pei Ru Evonne
12	30 %	With the majority of the children having prior knowledge to the topic/theme/concept it will be easier for discussions to be generated and with the basic knowledge that they have extended learning will be easier. (HYPO)	50%	I believe that some children who do not have the exposure will still learn for as long as the topic/theme/concept is appropriately chosen for their level. They can have the benefit of peer learning from the others who have been exposed to the topic which will later help to lead them into further discussions. (REAL)	nil	TEx: 8.5 yrs Stn: - Anonymous
13	50 %	I believe that if half the class don't understand or comprehend new topics or concepts it is evident that they require more insights about the topic. I also feel it would be difficult or meaningless for the teacher not to teach a new topic when she knows children cannot understand. (HYPO)	70%	We have rigid timetables and schedules to follow. However, as a teacher it is important to identify and find out if children are really learning a new theme or concept well when teaching. (REAL)	• Through questioning • Doing more hands on activities and individualized teaching sessions • Asking chn open-ended questions as well as critical questions • conversations	TEx:10 yrs Stn: 6-7 yrs Anonymous
14	70 %	I feel that it is considered a high majority of a group and it would be good to expose them to new topic/theme/concept as to broaden their horizon (HYPO)	70%	I feel that it is considered a high majority of a group and it would be good to expose them to new topic/theme/concept as to broaden their horizon (REAL)	• Q & A	TEx:8 yrs Stn: 3-6 yrs Madihah Tahar

15	5%	A lesser percentage would be better and we need not spend too much time introduce new concepts. The balance 95% might not also have enough knowledge, but they would be able to create enough to share views with their peers(HYPO)	15%	This is quite common in my classroom and these children still able to catch up but it took a longer process (REAL)	From a child's response might not be relevant to what they are learning. The child's attitude towards learning – lack of interest; gets distracted easily Confidence level – do not dare to attempt task individually needs reassurance Unwilling to participate in activities conducted	TEx: 14 yrs Stn: 6-7 yrs Linde Othman
16	50 %	Of the need to complete the curriculum demands (HYPO)	0%	I feel that what the teacher teach whether the children know or do not know the topic/concept could bring the children's understanding to another perspective (REAL)	• By interacting with the children (talking to them) • During discussions (large & small groups) • By talking to parents about the child's interest, which may interfere with what the chn know as a result of his/her enthusiasm towards a subject/topic. • Assessment • Observation of the child and analyzing his/her strengths or weakness	TEx:8 yrs Stn: 3-4 yrs Tok Xiang Ling
17	40 %	Almost half of the class needs facilitation and would rather focus on a new topic/theme/concept to suit the standard of the majority (HYPO)	20%	I would rather teach a topic/theme/concept that the children can relate to (REAL)	• Ask questions • Observation • *Children's work* • Tel: 97834017 Basically I would observe children through informal and formal observations. Formal would be the usual observational records and checklist. Informal may be during lessons or while the children are playing, where I would see if they are able to revise what they have learnt on their own, whether spontaneously or not. For example, there was a recent incident where I wanted to observe how much Mathematical concepts the children have been able to pick up during the whole year. Thus, I used colored cubes and observed them through the use of a game, where they should me	TEx: 3yrs Stn:2-4yrs Corrinne Cheong

					their knowledge of measurements. As for children's work, it can be those given by the teacher, or those done spontaneously by the children.(email reply 2 Jan 2011)	
18	20 %	I believe that this 20% of children would be able to have a grasp of the topic being taught over the period of time given to teach the new topic (HYPO)	20%	Same as above. In fact the topic that is being taught in the classroom are topics that the children are familiar with so the percentage does not really matter (REAL)	Prior to the start of the new topic, I would ask *question or do activity* that would help me to gather the child's prior knowledge. Tel: 84443548	TEx:3 yrs Stn: 3 yrs Noor Hidayah
19	30 %	I believe that with exposure and teacher's guidance the children with insufficient prior knowledge will learn as much as those children who have the knowledge (HYPO)	20%	There is always the chance that the children with less prior knowledge are those who have a tendency to be absent from class and it is harder for them to catch up with the limited time constraint during class time. (REAL)	NIL	NIL
20	50 %	What is the point if half of the class does not have prior knowledge of the new topic (HYPO)	20%	Even 20% of the children have insufficient prior knowledge will still teach the whole class and it will pull out the 20% children in small groups and reinforce the topic again to make sure they understand the topic. (REAL)	When we do a follow up activity, confused behaviour, refused to converse, visually by observing	TEx: 4 yrs Anonymous
21	NIL	I don't teach new topic/theme because we must try our best to teach the children and expose them to the new knowledge and learning opportunity (HYPO)	NIL	I don't teach new topic/theme because we must try our best to teach the children and expose them to the new knowledge and learning opportunity (REAL)	From the sharing session, daily interaction and introduction of new topics in class. We also question and observe children's gestures/body language when we conduct our lessons	TEx: 4yrs Stn: 5 yrs Anonymous
22	NIL	I believe in child's interest and therefore we do not have planned themes for the year. In addition we cater to individual needs and this is why we do work in large groups, small groups and one-on-one we will change our inquiry when the children no longer show interest in it. (HYPO)	NIL	As I mentioned, we don't choose inquiry based on nothing. However, when we do approach a new inquiry we have to consider and discuss with the children to find out their prior knowledge (REAL)	In early childhood a teacher usually know by the child's facial expression and confused behaviour when you ask them a question. I believe that early childhood educators are gifted and know their students well	Stn: 3-4 yrs Anonymous

23	100 %	I can always introduce and have one in this topic only to know that they may pick up something new. How can we tell if all the children know the topic and not do it. (HYPO)	100 %	I will never know how much of prior knowledge there children are at using a KWL world be a good gauge to know where they are. (REAL)	Through using of KWL Compare chn's drawings with KWL?? Rebecca Chan	TEx: 16 yrs Stn: 2.5- 6 yrs Ava Wang
24	10 %	No matter what knowledge/learning has to take place (HYPO)	10%	No matter what knowledge/learning has to take place (REAL)	Through on-going assessment Formal assessment Questionnaire Small group teaching Analysis of the 5 domain (physical, intellectual, emotional & social)	TEx:2 yrs Stn: 4-5 Amidela
25	10 %	Even though everybody knows about the topic I still have the confidence that I can deliver new knowledge about that particular topic which will benefit the whole class (HYPO)	10%	It does not matter how many children knows about the topic. I will still conduct the lesson. I usually use "KWL" strategy.. So I will know what they want to learn before I prepare my lessons (REAL)	1. When I talk about a theme, they won't ask much questions 2. When I ask questions, if they cannot answer to that question 3. When do an activity and ask them to reflect on that activity and if they cannot	TEx: 15 yrs Stn:6 yrs AJA
26	50 %	Personally as a teacher it does not affect if they have prior knowledge as educator if we teach a new topic well enough they would/should be able to understand the topic well. (HYPO)	50%	As educators again the children would be able to grasp & understand a new topic/concept introduced to them when taught efficiently (REAL)	NIL	TEx:5 yrs Stn:3-5 yrs Anonymous
27	50 %	To proceed with a series of learning will be a long process for children. Should most of them already know then it will be unfair. But if 50% chances that more that the actual percentage of children do not know in-depth (HYPO)	70%	We have curriculum to fulfil unless more than 50% children do not know then we are able to do up the current curriculum and plan new lessons (REAL)	Through their expressions (blur) and when asking them questions, they could not relate at all.	TEx: 15 yrs in this industry Dionne
28	100 %	A high no. Of children are lacking of the knowledge (HYPO)	90%	I need to make sure that everyone has the same understanding (REAL)	• Mind map about the topic • Expressions and thoughts • Chn lack of prior knowledge	TEx: 3.5 yrs Stn:2- 6 yrs F.A.

29	100 %	Most of the kids do not have the prior knowledge (HYPO)	90%	To cater to the majority (REAL)	• Through class discussions • Mindmap • Children thinking process	TEx: 4 yrs Stn: 4-6 yrs Fae
30	100 %	It would be good to feel confident that the entire class has grasp the topic/theme/concept at their pace. This is especially applies to concepts that are building foundations for further learning (HYPO)	80%	I work in a childcare setting where there would be time to work with children needing more support in understanding and grasping topic/theme/concepts that were taught. (REAL)	NIL	TEx: 3 yrs Stn:18 mths – 4 yrs Anonymous
31	20 %	I would conduct a separate session for the children that do not understand the topic/concept (HYPO)	20%	I would conduct a separate session for the other group of children (REAL)	• I would talk to them • Have private discussions with the chn • Through daily observation & reflection • Parents feedback • Through daily work • Through their drawing & conversations they have with their friends	TEx: 5 yrs Stn:6-7 yrs Sharifah
32	30 %	Most of the children will be more eager to learn if they are unsure (HYPO)	10%	I can conduct another lesson with the other 10% (REAL)	• When they display behaviours that shows that they do not understand • When they keep asking the same questions repeatedly	TEx:3 yrs Stn: 3-4 yrs Nuzurul
33	10 %	I felt that in learning every new material it is important that the children have prior knowledge in order to connect to the new information that they gonna acquired (HYPO)	30%	Of the pace of curriculum and at times absence of the children I could not drag the new materials for too long. However could adjust/modify it to fit the demands. (REAL)	• When the children display behaviours that are not relevant to topics taught • When they ask repeated questions • When they are afraid to try or afraid in engaging in task	TEx: 4 yrs Stn: 2-3 yrs Cannie Yeo

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
24 INSERVICE RESPONDENTS:SIM

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out children's insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	10%	Children need to have prior knowledge so that easy for them to acquire new topic/theme/concept. This will enhance their confidence and keen to learn more about the concept. (HYPO)	10 %	Children need to have prior knowledge so that easy for them to acquire new topic/theme/concept. This will enhance their confidence and keen to learn more about the concept. (REAL)	During the lesson or follow up, interact with the chn. Observe chn's discussion time.	TEx: 6 yrs Stn: - Ong Chan Tee
2	20%	More children will be able to relate to the new topic. (HYPO)	25 %	It will be good to relate to their experiences so that learning will be more meaningful. (REAL)	NIL	TEx:NIL Stn: NIL
3	NIL	NIL	15-20 %	I want to make sure that almost everyone are able to understand the topic that being taught. (REAL)	NIL	TEx: NIL Stn: NIL
4	5%	I still feel that whether hypothetically or real I will still want to ensure that my objective of teaching is met. There is no change in my real classroom situation. (HYPO)	5%	(REAL)	NIL	TEx: 7 yr Stn: 6-7yrs K. Saraswath
5	5%	There will be a platform (the children's knowledge & experience) to build on and extend the children's knowledge. The 5% would consist of probably a special needs child (whom I would still have to include and one other whom may come from lower SES background) (HYPO)	20 %	This is realistically the figure that presents itself in my daily course of work. I would increase the percentage if the clause in the (*insufficient to achieve the learning objectives of your class) as above was not indicated. Most of the time, in a class, sometimes 30% of the children have insufficient prior knowledge but the percentage decreases as sometimes a percentage of these children can actually achieve the learning objectives of the class despite their lack of prior knowledge. (REAL)	In the course of interaction with them: talking; observing them wtih their peers and other adults.	TEx: 20 yrs Stn: 4-6 yrs Adeline Koh

6	10%	I am confident in the ability of experience teachers that at the end of the theme, the 10% would be able to inculcate some knowledge. (HYPO)	5%	It would be easier to achieve the objective in ensuring that the 5% of the children with insufficient prior knowledge to understand the new topic/theme to reach 10% as in an ideal situation, the theme/topic might have to be extended for a slightly longer period. (REAL)	a. Through interacting with the chn b. From having discussion with the child's parents c. From children's finished worksheets/activity sheet	TEx:NIL Stn: NIL Angie Ng
7	0%	Ideally, it will be good to have all the children grasp the concept before I move to a new topic. (HYPO)	10 %	In a class of 30, to have 3 children having insufficient prior knowledge is a acceptable for me to teach a new topic. However I also have the constraint of keeping to a timeline/calendar. These children will require one-to-one time with me whenever I can afford. (REAL)	NIL	TEx: 7 yrs Stn:4-5-yrs Joanna
8	100%	I believe children can be introduced to any topic or theme even without any prior knowledge. (HYPO)	100 %	I believe children should be given opportunities to learn new concepts. This is all the more important for children who lack the environment to access to knowledge (REAL)	Ask chn if they know anything about the topic, concept. Gather from their response if they have ever heard about the concept/topic/subject/word	TEx:5 yr Stn:5-6 yrs Yvonne Lim
9	10%	Every child deserves the opportunity to learn even though they do not have prior knowledge on a certain topic/theme/concept. Probably the teacher can teach this group of children in a small group setting and extend the learning for 90% of the group who have sufficient knowledge (HYPO)	10 %	If we do not teach those that had insufficient prior knowledge then they will miss out on certain knowledge necessary for preschoolers. The lesson can serve as a resource for those that know and introduction for those that have insufficient knowledge of. (REAL)	By questioning them and assessing them through checklist and assessment or through games	TEx: 12 yrs Stn: 4-6 yrs Francesca Low Fei Cheng
10	5%	I feel that majority of the children will be able to benefit if those children with insufficient knowledge require more guidance I can provide one-to-one or small group teaching with them outside of the lesson time. (HYPO)	5%	I would want to practice that in a real situation. (REAL)	Through class discussions (small group)	TEx: 3+ y Stn: 3-4yrs Lina
11	10%	It can't be too high because if they knew the topic they will feel bored. (HYPO)	10 %	It can't be too high because if they knew the topic they will feel bored. (REAL)	By asking questions	TEx: 5 yrs Stn:5-6 yrs
12	5%	I go with the majority of the class(HYPO)	2%	Planned lessons still have to go on. 98% of the children already have some knowledge. So I would carry out the lesson first and get back to the 2% later on. (REAL)	I will find out by observing the chn and interact with them. Daily observations and interactions with the chn will help me to gauge how much knowledge they have	TEx: 9 yrs Stn: 3-4yrs Patricia Lyn

13	10%	If the majority knew about the topic they would be bored during lessons (HYPO)	10	If the majority knew about the topic they would be bored during lessons (REAL)	By asking/talking to them	TEx:7 yrs Stn: 5-6 yrs Jenny Tan
14	20%	I feel that it is very hard to conduct a lesson with some kids unable to fully understand the theme. I would then go back to teaching them what they should/or do have prior knowledge first before teaching something new. (HYPO)	70 %	Most of the time we teach things that children may not know beforehand. And in order to follow the curriculum there's no choice but to teach whatever is already asked of by the curriculum, time constraint is a factor too. (REAL)	Through questioning them and comparing it to others of the same age to see if it may indicate that a child is behind to his/her peers	TEx:3 yrs Stn: 2-7 yrs Maybeline Tan
15	50%	To encourage classroom participation (HYPO)	40 %	For better class discussion rather than teacher does the talking (REAL)	Thru' interaction, classroom observation while chn at work, Q & A, checklist (documentation)	TEx: 17 yrs Stn: 3-6 yrs Tan Guat Keng
16	50%	All materials are prepared prior lesson. For the sake of the 50% who understands and can learn more from the lesson. For the other who no knowledge will do reinforcement to enable them to have basic knowledge of the topic(HYPO)	100 %	All lesson plans are done before and by the school we are not allow to divert from it. We can only simplify our teaching. (REAL)	Via interaction with them. Open discussion on topics/themes. Which usually interest chn should evoke interest and interaction if child does not understand or share bewilderment than the child probably did not have prior knowledge.	TEx:8 yrs Stn: 6 yrs Shirley Soh Lay Hong
17	35%	Even though more than half of the class have some knowledge of the topic, I can extend their understanding while giving the other 35% a chance to learn something new. (HYPO)		When half the class has sufficient prior knowledge they can help to stimulate active/constructive discussions as I conduct my lessons/activities to teach the topic which is new to the other half (REAL)	Through asking questions related to the topic	TEx:6.5yrs Stn:6yrs Lim Hui Min
18		Dear Rebecca I am not able to complete this survey as I hardly teach the children. Our curriculum is pre-planned in advance (usually a term) and no way for us to make changes to the objectives set. However, we are allowed to make modification to the lesson plan. I am sorry I can't be of help. (HYPO)			Through observation, communication with parents/immediate caregivers Example: Lesson plan evaluation, portfolio, checklist, checking with the child /co-teachers and family members.	TEx:14 yrs Stn: 4-6 yrs Soon Bee Ling

19	10%	All chn are entitled to learn (HYPO)			• Through questioning • Through observation of children's play/ in solving problem	TEx: 8 yrs Stn: 4-6 yrs Mabel Ho
20	50%	At least ½ of the class has prior knowledge to answer my questions or at least participate in the discussion (HYPO)	50 %	At least ½ of the class has prior knowledge to answer my questions or at least participate in the discussion (REAL)	By doing observation on children and simple test (code: assessment)	TEx: 5-6 yrs Nelylisda
21		(HYPO)	50 %	Some children that I had taught do not have supportive families, hence I would teach this topic. (REAL)	Based on observation and documentation with regards to developmental milestones and the norms in the class.	TEx: 11yrs Stn: 6 yrs Mak Kit Leng
22	-	NIL(HYPO)	20 %	It benefits the 20% of children while it's a reinforcement for the 80% of children. (REAL)	Through observation During sharing session with chn, they may not be able to contribute even after much encouragement. The facial or body expressions of the child Through daily conversation, interaction with the child	TEx:10 yrs Stn: 18 mths -6 yrs Maggie Lee
23	-	NIL(HYPO)	20 %	There may be new entrants of children in the class and with this batch, concepts can be introduced gradually through small group teaching while the other group can be advanced to doing their main activity as usual without the expense of the learning pace of both different levels of children (REAL)	Through baseline assessments and observations of daily activities such as drawing, writing, playing during learning centre and transition	TEx: 4 yrs Stn: 2 6 yrs Swee
24	10%	All learning objectives are linked to one another. Thus if the basic is not learnt enough by the children they cannot improve themselves upon. BUT i will only re-teach once more. (HYPO)	10 %	NIL (REAL)	Through observation, assessment and checklist	Female Jean

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
8 INSERVICE RESPONDENTS: SDE05

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out children's insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	20 %	The majority of children would be able to share their experiences or contribute significantly to inspire and create an interest amongst the rest to learn (HYPO)	90%	Lesson plans and curriculum might be largely tailored and fixed. Sometimes teachers would have to introduce learning experiences to the class just in order to carry out a proposed curriculum (REAL)	During lessons, chn do not seem interested or contribute their views and opinions eagerly. Even after changing the teaching methods or mode of delivery, chn still seem disinterested.(8 Sep 2010)	TEx: 4-5 yrs Stn: 4-5 yrs Amutha Ransasamy
2	30 %	I feel that 30% of the students with insufficient prior knowledge will be able to learn from their peers (HYPO)	100 %	The curriculum is not designed by the teachers but pre-designed by the curriculum department (REAL)	When chn do not respond to teachers' promptings. Observe chn during lesson time and doing work.	TEx:1yr 8 mths Stn: - Melanin Chan
3	20 %	Majority of the children are ready to move on and for this 20% I can and will conduct separate or 1-to-1 sessions (HYPO)	30%	There are scheduled lessons to be completed and such majority are ready to move on will need to do so. Balance will be taught at separate sessions (REAL)	When the child does the follow up activity and from it, if they are struggling with the work, will ask or test them verbally to see if they are able to understand what was being taught	TEx: 2.5 yrs Stn: 4-5yrs Janice Wong
4	10 %	No one should be left behind. It's a matter how in-depth or how many lessons I want to use to cover. (HYPO)	10%	Even if most of the children have prior knowledge they wouldn't mind learning again ~ especially when the children can learn new things about something they already know. (REAL)	By asking questions or talking about the topic in a group. Usually when chn are able to share their experiences I'll tell that they have prior knowledge. But I would not know how much they know unless I talk to the parents. So usually I'll assume that when chn are still interested in the topic, it means they want to know more.	TEx: 1. 5 yr Stn: 4-5 & 18mth – 2.5 yrs Lena

5	15-18 %	I'll continue to teach new topics if majority of my class understands the lessons taught. Majority means approximately 10 kids out of 13 kids. (HYPO)	20%	If only a small handful of children does not understand the topic, I'll then do small group teaching till they have a better understanding of the subject. (REAL)	1. My centre prepares worksheets for chn to do every lesson, hence I'm able to assess their understanding from the worksheets they have done. 2. Through observation during lessons: chn's answers to the questions I ask.	TEx: 4-5 yrs Stn: 3 yrs Sherlyn Ang
6	30 %	The topic can be presented in different ways to those who already have prior knowledge so that they too benefit from the lesson. (HYPO)	30%	The topic can be presented in different ways to those who already have prior knowledge so that they too benefit from the lesson. (REAL)	Through their drawing, wrong representation, no-existence representation, questions and answers.	TEx:6 mths Stn: 3-4 yrs Yeo Hwee Cheng
7	80 %	It would allow for a small group of about 4 children to take on an extended project(s) to challenge their thinking(HYPO)	50%	Children may state themselves to be knowledgeable or appear to be so when in fact their knowledge is superficial. Therefore, if it appears that 50% of the children have insufficient knowledge, the true percentage is likely to be much higher. (REAL)	I think the quickest way would be to read a story book introducing the subject and to prepare questions for the chn to answer as the book is read. The child could draw on the whiteboard to further clarify their understanding.	TEx: 6 relief yrs Stn:4-5-yrs Jean Maissen-Welker
8	15 %	15% of a class of 24 children is only about 3 children, which is manageable for teach to coach more closely on one-to-one. (HYPO)	15%	15% of a class of 24 children is only about 3 children, which is manageable for teach to coach more closely on one-to-one. (REAL)	1. Through conversations with chn 2. Bringing in items, pictures to tease out prior knowledge 3. Conversations with parents, caregivers 4. Through their drawings?! Though may be child's choice to omit drawing it and not out of little knowledge.	TEx:1 yr Stn:5-6 yrs Serena

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
12 INSERVICE RESPONDENTS: Praises

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:		
1.	10 %	Every child has a chance to be educated, (1) as a professional early childhood teacher we have the responsibility to let preschoolers the right to fundamental knowledge (translated from Chinese) (1) P	50%	Early childhood teacher faces a class as a whole, in every class all preschoolers each has different temperament and learning ability (1) P	Through discussion, conversation, asking questions – give every preschooler ample opportunity to express themselves, thus able to understand the level of their understanding(1)	TEx: 1 yrs Stn: 2-4 yrs Deng Yan Xia
2	10 %	We ought to give every child equal opportunity to learn (translated from Chinese) (2) P	50%	More than half of the children lack this area of knowledge; it reflects on whether the topic is too difficult or the children's ability to understand the knowledge is limited (2)	Through the children's conversation and communication.(2)	TEx:13yr Stn: 5 – 6 yrs Chen Qing
3	10 %	I believe that it's a teacher's duty to impart the knowledge to all the children. No child should be deprived from any forms of education for any reasons (3) P	10%	My motto is "no child left behind" and it'd be challenging for the teachers to make the lesson interesting for the rest of the 90% too.(3)	Through discussions, eliciting and asking questions(3)	TEx: 4 yrs Stn: 5- 6yrs Win Moh Moh Han
4	NIL	NIL	10%	Even though only 10% of them had insufficient prior knowledge of the new topic they should not be deprived of gaining information about that particular topic. Whereas for the 90% of the students they will learn more effectively as they already have prior knowledge about the topic. (4) 2. And as a teacher, I can link or add on new information to the students prior knowledge to activate their interest and curiosity. I also can build on what they already know not just giving information but asking them to provide and share these information with their friends (4)	Through class discussions, sharing sessions, interaction with students and graphic organizers (mapping) to activate a student's prior knowledge about a topic(4)	TEx: 6 yr Stn: 6-7 Safiah Bte Suna'aim

5	10 %	I don't want to leave any child behind (5) R	10%	We have to follow the curriculum and it will also be challenging for the teachers to make the lesson interesting (5)	I can find out through: 1. Their time of attention span in class 2. Their understanding level 3. Their communication with us 4. Their body language	TEx: 14 Stn: 18 mths 3 yrs Joanne Goh
6	10 %	I don't want to leave any child behind (6) R	10%	As a teacher responsibility we still have to follow the curriculum and it will also be challenging for us to make the lesson interesting (6)	I can find out by asking the questions,(6) through discussion and sharing sessions. (6)	TEx:7 mths Stn: 3-4 yrs Goh Poh Liang
7	10 %	I don't want to leave any child behind (7) R	10%	We have to follow the curriculum and it will also be challenging for the teachers to make the lesson interesting (7)	I can find out through: 1. Their time of attention span in class 2. Their understanding level 3. Their communication with us (7) 4. Their body language	TEx: 9 yrs Stn:18 mths- 3 yrs
8	60 %	More than half needs to be taught the knowledge (8)	10%	It is a requirement that all should have the knowledge.(8)	NIL	TEx:10 yr Isaac Lim
9	30 %	I can built on to whatever knowledge that they have (9)	50%	Different children have different background and experiences. Despite being unable to achieve the learning objectives the ones with prior knowledge can help the others to understand the topic (9)	Through discussion (9), questions (9)	TEX: 3 yrs Stn: 5-6 yrs Norasykin Sazilin
10	20 %	This would denote that less than 10 students in a typical class of 40 would not have sufficient knowledge and I can assist them through practical hands-on, individual discussion etc. (10) Management	100 %	There are many instances where my adult students are career switchers this requires them to pick up the theories/practices/knowledge even if they do not have had prior knowledge. This is a case of no choice! (10)	NIL	TEx: 16 yrs Stn: 2-6/17-65 yrs Lema Iryanti Juri
11	90 %	It seems like a good and justifiable percentage. Justifiable in terms of changing resources, time spent adjusting to the new topic/theme/concept (11) Time Factor	90%	Again there are lots of planning involved such as curriculum, resources and perhaps time spent to organize and plan the new topic/theme/ outline (11)	NIL	TEx: 15 yrs Stn: 2mths – 6 yrs Shirley Soh
12	10 %	I believe that as long as children express an interest in the new topic, I will go along. For those who already have prior knowledge I can introduce activities to challenge their thinking on existing knowledge (12)	NIL	NIL	NIL	TEx: 4 yrs Stn: 5-6 yrs Loh Wai Fun

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
24 INSERVICE RESPONDENTS: DTEP02/17 AUG 2011

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out students' insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:		
1.	90%	It best to get children experience new things around them. Provide learning opportunity (1-90%)	80%	If I don't provide the opportunity for children to learn new things, when are they going to start learning (1 – 80%).(1)	Ask questions relating to the theme (1)	Chin Shan Ping, Angel Tex:5 yrs Teach: 4-6 years old
2	80%	I find that if there is so many percentage of the children who do not understand, it will be more fun and fair as children won't compare with kids who do understand(2-80%)	70%	In real classroom situation, some children who had knowledge on the topic would be able to help you with those kids who do not really understand about it. (2-70%)	We will ask them questions related to the topic/theme/concept and see if they can answer correctly (2)	Chan Jia En 2.5 yrs Teach: 5-6 yrs old
3	50%	Half of the class do not have prior knowledge and will be difficult to conduct or continue the lesson with the class (3-50%)	70%	If too many children know about the topic that I'll be teaching they will be distracting others rather than learn together with the others so a new topic to the children will be something new and keep them interested. (3-70%) (3)	When they seem clueless and distracted easily due to the young age (3)	Lee AiLIn Tex:3yrs 2-3 yrs old
4	20%	It is good to teach children new things (4-20%)	10%	It is always good to learn new things (4-20%)	I will ask open-ended questions to check if the child understands the theme. I will provide worksheets as well	Malini Tex: 4 yrs Teach: 6 yrs old
5	60%	I feel that it would do the children good to know/ learn new topic as we have to input knowledge to the children and they will be exposed to new things (5-60%)	80%	I feel that new topic/subject would be interesting as it would be something different from the norm topic (5-80%)	By class discussions and feedback from the children (5)	Razitah Binte Taib Tex:10 yrs Teach: 5-6 yrs old
6	30%	Prior knowledge need to be instilled to them. In a way to introduce a new topic to them. (6-30%)	30%	Even when children have insufficient knowledge it is teacher's duty to teach the topic. Teacher will find ways to have children understand and make the new topic interesting (6-30%)	If children do not have sufficient knowledge they tend to listen and observe (6)	Sarni Bte Abu Tex: 10 yrs+ Teach: 4-5 yrs old

7	50%	Children with the knowledge can share the ideas with the others and easier to teach (7-50%)	100%	We will not know if the children have any prior knowledge unless we execute the lesson. Also I think it would be good for peer learning if we discover that some children have knowledge and can help the others learn. (7-50%)	If the children are not able to execute the task or have no ideas what teachers are talking about (7)	Florence Lim
8	10%	So long as there is still a group of children who have not been exposed to this topic or has little information they still have the right to learn and to acquire this knowledge. (8-10%)	10 %	Same as above So long as there is still a group of children who have not been exposed to this topic or has little information they still have the right to learn and to acquire this knowledge. (8-10%)	Through observation and interaction (8)	Anonymous
9	10%	It's very crucial for young children between ages of three to eight. They would benefit more and be able to absorb the knowledge and skills through sharing of experiences (with peers) and teacher (using storybooks) (9-10%)	5%	There will always be teachable moments everyday in class (9-5%)	Through talking with children, understanding your children and observation of each child (9)	Veronica Wong Tex: 1.5 yrs Teach 4-5 yrs old
10	10%	Children will catch up along the way through peer learning and should not hold back those who are ready (10-10%)	50%	We have to follow the curriculum (10-50%)	Discussion, worksheet etc.(10)	Ivy Ang Tex:9 yrs Teach- K2
11	40%	40% is considered many children unsure of that particular topic. Almost half the class do not have prior knowledge, basic to build up on that theme therefore it's important to get them to know and experience. At least 80%-90% of the children should have the experience before moving on.(11-40%)	60%	Insufficient time. Rush to move on to next topic. Most of the time we tend to not have time to finish curriculum lesson plan as group given is too large. Recording of development is not done consistently because we have to take photos, teach and write dev we do not have the time with the large group in a class. (11-60%)	Ask questions, to scaffold their thoughts (11). Through written/drawing of experience,(11) sharing sessions. Confidence of answering. (11)	Iu Zafirah Binte Ismail Tex: 4 yrs Teach 3-4 yrs old
12	30%	70% of the students are familiar with the theme thus they will be able to help those who have less prior knowledge (12 -30%)	50%	50% of students with insufficient prior knowledge is still manageable to teach (12-50%)	When they are unable to relate or would not be able to answer the question asked (12)	Ummu Tex: 2.5 yrs Teach: 5-6 yrs old
13	0%	It will be like a refresher's course for the children. This will able them to recap and learn new knowledge from their peers. This will also inculcate the love to learn (13-0%)	30%	I love to teach new things/knowledge because as I teach I myself will learn as well. Encourage the meaning of sharing and the excitement of learning new knowledge through fun activities. It doesn't matter to me the amount of children who have insufficient knowledge but it matter to me about giving them knowledge (13-30%)	When the children asked "Questions" and gives answers like "I don't know" or giving the blank look.(13)	Nurul Raudha Tex:5 yrs Teacher 18mths-3 yrs

14	100%	The learning rate of every child will be the same. All will learn at the same speed. (14-100%)	0%	Children may know the particular topic but they can still learn new things or have new insights in regards to the topic (14-0%)	When they cannot response to my teaching or questions in regards to the topic (14)	Elsie Lim Tex;10 yrs
15	40%	I have the duty to teach the children to ensure children learn and gain knowledge (15-40%)	100%	I want children to have the concept (15-100%)	By questioning (15)	Lim Yueh Ying Tex: 10 yrs Teach: 6-7 yrs old
16	50%	The lesson would be easier (16 -50%)	100%	It is my responsibility to teach (16-100%)	Before actual lesson starts just ask a few related questions (16)	Salmah Mohd Dawood Tex:2 yrs Teach:3-4 yrs old
17	80%	Some topics such as "Racial Harmony', Hari Raya Puasa, Deepavali children are not aware why other races celebrate these festivals	70%	I want them to know the real concept of certain particular topics where they have not learnt before. Some might of prior knowledge regarding to the input but unaware of the need or proper ways of going about to do it. (17-70%)	When we ask them the topic or what they understand about the topic. Why is it compulsory that they must know the concept and the rules to follow e.g. simple routine care and transition times (17)	Radhadevi D/O M.K.S Tex: 20 yrs Teach 4 – 6 yrs old
18	40%	Children will still learn something through any discussion (18 -40%)	30%	Even if the remaining 70% have some knowledge; teaching the new topic may reinforce or help them gain more interest in the topic. Hence children are still learning.(18-30%)	When children don't relate to the questions asked. (18) Observing from their response such as drawing, comments(18)	Amalina Amin Tex:2 yrs
19	80%	The new topic will capture their attention. The 20% who knew the topic may be called to provide prior knowledge – first- hand experience (19-80%)	60%	I aim to explore/introduce as many topics for the children to do discovery on their own (19-60%)	By asking questions and introducing keywords from the topic(19)	Yani Tex: 4 yrs Teach 5-6 yrs
20	20%	Other children already have the prior knowledge and they can help each other in understanding the topic (work as buddies) so they can share what they know and wants to know (20-20%)	20%	It is good for the children that have insufficient prior knowledge to have an exposure and learn more on the topic. It is also unfair to the other 80% that have exposure to the topic if I did not discuss the new topic with them (20-20%)	I find that these students may need more exposure to their surrounding and maybe more interested in learning something new to them(20)	Nuraishah Hassan Tex: 3 yrs Teach 4-5 yrs
21	50%	For those children who have the knowledge other children will be able to benefit – peer learning (21-50%)	70%	They would be more interested and will not be distracted by those who already know the topic (21-70%)	When they have lots of questions on the topic discussed and they are very interested and enthusiastic about the topic.(21)	Zahara Tex:2.5yrs Teach; 5-6 yrs

22	0%	It be better for the whole class to be able to learn and to get expose to new learning (22-0%)	0%	I can get them to talk, discuss about the new topic e.g how they feel about the topic what they know about it. (22 -0%)	Ask them questions relating to the topic. Talk about the topic (for children who knows a bit this is to access their knowledge and how well and the depth of their understanding) (22)	Olivia Benjamin Tex: 4 yrs+ Teach: 4 yrs old
23	0%	My job is to teach and also to expose children to things that they do not know. Hence giving them the prior knowledge (23-0%)	0%	I want to expand their knowledge (23-0%)	I will ask question and listen to what they will tell me.(23)	Oh Cheng cheng Tex: 4yrs Teach: 3-4yrs
24	50%	As I feel that most of them are still not aware of the topic/theme/concept	60%	There's always shortage of time to teach a new topic/theme/concept. Again to those who already know. As a teacher there's so much work to be done and I have to find extra time to set up learning centres- However if 60%-70% of them don't know I will have to "squeeze" time to teach those concepts again.(24-60%)	Asking them questions (24) Asking them to try out the materials/resources provide there Asking parents to reinforce the new topic/theme/concept at home. When children come back to school and reinforce those concepts again (24)	Lee Sui Fong, Eunice Tex: 12 yrs Teach 2-3 yrs old

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
34 INSERVICE RESPONDENTS: TEP04 (29 Nov 2011)

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out students' insufficient knowledge	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	0%	I am looking at the developmental range of my children. I look at their needs and interests because the learning is not just mine...(1)	0%	In the current local system, themes are planned for the calendar year. Children are "taught" accordingly with flexibility for revision upon consideration/permission from principal and administrative personnel(1)	1. Through Informal observation: finding out from parents, children their areas of interest, knowledge (1) 2. Through formal observation: colleague's expertise, set of national assessment guidelines (1)	TEx: NIL Stn: 18-6 yrs Vicky Kwek Siew Choon
2	90%	I believe that it is important that a larger percentage group of students to be familiar so that for the balance 10% of the students, teachers may work with them during learning centre time separately while the others are interacting with new materials on the shelves. Those students who are familiar may interact with the weaker one through meaningful play together(2)	80%	I would want to have an active response in class as I believe that even though children couldn't really answer, they may imitate their friends and the knowledge will be imparted to them. (2)	Interactions regarding the theme between peers (through observations) or Teacher-child.(2) Allowing them to experience the materials and seeing their response (2).	TEx:1yr 8 mths Stn: 2-3 Fauza Binti Idris
3	NIL	NIL	80%	If majority of the children don't have prior knowledge, they will be more interested to find out more as a class (3)	When you talk about it, children ask you what is that (3)	TEx: 12yr Stn: 4-5yrs Anonymous
4	10%	The theme could be used as an reinforcement for other children while the children who aren't familiar with the topic will experience a new lesson (4)	30%	In classroom although however much I wish to concentrate on a topic longer, time is a constraint.(4)	By introducing a topic and allowing children to talk and share about their knowledge (4). As well as the various activities done in class, ability can be observed (4).	TEx: 2.5yrs Stn: 4- 6; 9-10 yrs Darshni
5	50%	I felt that it makes sense at least teach or carry out a lesson when most of the students understand what was being taught (5)	80%	Most of the topics/themes/concepts used are of prior experiences that children could relate to(5)	- When they can't answer questions(5) - When they can' do the task given (5) - When they look blurr!(5)	TEx:4yrs Stn: 18mths- 3 & 3-4 yrs

6	20%	To me even though the children do not know the topic at least through exposure, discussion, they will be more aware of topic (6)	80%	The children will be more interested in the topic (6)	Through class discussion and sharing session we can find out if the students have insufficient knowledge of the topic	TEx:9yrs Stn: 6-7 yrs Anonymous
7	0%	Children should be exposed to all kinds of topics (7)	30%	Lesson will be able to carry out in a less stressful manner enjoy the children's contribution to the topics (7)	They will not be able to contribute to the topic, blank faces(7)	TEx: <3mths Stn:2-3yrs Anonymous
8	30%	I believe that out of 10 if 3 children are insufficient to achieve the learning objectives in class is rational. Moreover, I feel that I also have to move to new topic one after the other for children.(8)	50%	Sometimes due to time constraint we move to new topic and it is considering about the 50% who are sufficient (8)	- Assessment (8) - Observation (8) - Documentation (8) - Checklist (8)	TEx:NIL Stn:NIL Anasha
9	5%	I have students with language barriers and special needs children	5%	I have students with language barriers and special needs children	Doing checklist and observation on each child every week after teaching the topic (9)	TEx: 4yrs Stn: 4-6;yrs Nuruljannah
10	5%	I feel it is important for every child in the class to be almost on par in terms of knowledge in order for lessons to take place effectively (10)	5%	In the long run, it is beneficial for both the teachers & students as 'peer incidental' learning can take place(10)	Through circle time/discussions it can be apparent as to what the children have experienced and what their insufficient prior knowledge. (10)	TEx: 2yrs Stn: 4-6yrs Anonymous
11	40%	I think it's important to teach children new topic even though they have sufficient prior knowledge. It will also be fair to those who have insufficient knowledge. Children with sufficient knowledge can gain more knowledge (11)	30%	Even though some of them (60%) have understanding on the new topic it's not fair for the ones who have insufficient knowledge if I don't teach the topic. (11)	Get them to talk about the topic first. Show pictures/articles about the new topic. If children do not contribute to discussion it means that they have insufficient knowledge (11)	TEx: 2yr Stn:4-5yrs Syazwani
12	40%	I realise that the children need to have at least some basic knowledge in the particular topic or some pre-requisite skills for the concept for the teacher to be able to build on it. (12)	50%	I need to set realistic objective for the children to achieve(12)	1. by doing the KWL chart with the children (12) 2. Playing a game that has the particular concept in it (12)	TEx: 2yrs Stn: 19-2yrs Norain Yahya
13	35%	I can use different strategy or method to teach the topic. I can also encourage the more competent children to peer teach the ones needing assistance.(13) Give the group of children more time to cope with the topic 1-to-1 session will also help.(13)	35%	I can use different strategy or method to teach the topic. I can also encourage the more competent children to peer teach the ones needing assistance.(13) Give the group of children more time to cope with the topic 1-to-1 session will also help(13).	When they do not participate in classroom discussion (13). When they appear not interested to participate in the activities carried out (13). They get easily distracted – they would avoid eye contact when asked a question(13).	TEx:2 yrs Stn: 3 yrs Nur Hidayah

14	5%	Personally I believe that there's no such thing as the children have "known all things" already at their age. There'll sure be something new for them to learn even though they've "already know" the topic, theme or concept.(14)	NIL	NIL	"survey" – through questions(14) Interacting with them (14)	TEx:<1 yrs Stn: 4-5 yrs Ong Pei Ling
15	50%	I feel that it is important for the children to be aware of what is going on in the classroom(15)	10%	I believe that all the children should know about the theme/topic. At least they are aware. I believe that this is fair(15)	By having a discussion and talk about it. The topic theme can also be discussed in their mother tongue(besides English)(15)	TEx: NIL Stn: 4 yrs Anonymous
16	75%	I feel that when there is a more than half the class unaware of a certain concept there will be greater curiosity amongst the children, while the other 15% will supply the class with the knowledge in the concept.(16)	50%	It is required by the management even if half the class is aware of the particular concept (16)	Through classroom discussions, (16) story telling (16) /questioning (16)	TEx:1yr Stn: 5-6 yrs Pamela Lai
17	60%	Children enjoy learning new stuff regardless of whether they have sufficient knowledge of the topic or not. When I know 60% have interest & knowledge, than it wouldn't be hard to teach the topic as its possible the interest and knowledge can spread(17)	50%	NIL	I will ask questions related to the topic/theme (17)	TEx: 5yr Stn: 4yrs Dakshna
18	30%	Accordingly to the seven thinking Hats if 30% of the children do not know about the topic, the instructor had a duty to teach because half of the population do not know.(18)	50%	According to the seven thinking hats, half of the population is needy	Through survey (18) and observation (18)	TEx:4yrs Stn: 5-6 yrs Joan Lee
19	85%	The children would gain knowledge from this topic(19)	60%	Generally the children should know the topic (19)	By asking some questions and talking about the topic (19)	TEx:1yr Stn: 4 yrs Lim Lee Ching
20	20%	Not all children learn at the same pace. Also different children have different exposure. Hence, I believe not all children are as privilege as one another. It is impossible to have 100% children with prior knowledge of any new topic/them/concept that I were to introduce to them. (20)	30%	Realistically not many children are as exposed to different concepts/topics/themes (20)	By talking to them one on one and asking questions if they are aware of what i am talking about after the large group discussion time (20)	TEx: 2.5 yr Stn: 4-6yr Priscilla Teo

21	50%	When 50% have prior knowledge, they would be able to help the other 50% along the way. This would help build better bond within the class. Once 100% of the children are familiar with the topic/theme/concept I would then go further into it. This way it is a win-win situation for both groups of children & puts them on a similar level of understanding after being taught. (21)	30%	30% would be a decent percentage as there would be 70% whom are already exposed to it. Therefore, i would be able to focus more on the 30% when starting the topic/theme/concept (21)	When they are unable to answer questions which most of their peers can (21)	TEx: 2yrs Stn: 3-4 yrs Celeste Koh
22	70%	It will be a great adventure to embark into unknown territory to the children. The 30% should not be seen as an obstacle to the children's learning but to be a source of motivation to move deeper into the topic (22)	50%	I had to come up with a number. Normally I would go by interest. The higher the percentage of children wanting to venture into the topic, the more it will be chosen (22).	I would normally bank on interest. *Interest makes the learning experience more worthwhile*. Drilling them into venturing into unknown topics may cause reluctance in my opinion (22)	TEx: 3yr Stn: 1.5-3 yrs Nunsyfiquah
23	80%	Even if the class generally has sufficient knowledge of the topics revision is always beneficial.(23)	80%	Answer same as above: Even if the class generally has sufficient knowledge of the topics revision is always beneficial(23)	If the general questions posted on the topic cannot be answered (23)	TEx: 2yrs Stn: 2-6 yrs Anonymous
24	60%	The other 40% will probe answers when questions are laid out. This will eventually encourage them to have inter-friend communication and exchange of ideas (24)	50%	Having half of the class sufficient would mean equal amount of peer/buddy working system(24)	- Through general communication from parents (24)	TEx: 4.5yrs Stn: 2-6 yrs Anonymous
25	NIl	NIL	75%	It is better to cater for the majority, at least the minority could be taught through one to one teaching or probably through different way of teaching technique (25)	By giving them question relate to the topic. Also through the interest shown (25)	TEx: 4yrs Stn:5-6 yrs Anonymous
26	99%	If the new concept is crucial to the child's development as a whole, we will need to introduce the concept even if only 1% of the children had insufficient prior knowledge.(26)	80%	It's easier to plan the lesson that will cater to the children's needs if the majority is on the same level of understanding.(26) The children that have prior knowledge can then take the lesson as a review or they can help assist the other children. (26) If most of the children already have prior knowledge its hard convince to parents/school why we need to introduce the concept(26) Rebecca Chan – in other words there is no point in teaching something that the kids already know? – a waste of the kids' time thus hard	Through prior assessment (entry level) (26)	TEx:3-5 yr Stn:3-5 yrs Pamela

				to convince parents?		
27	40%	If half of the class don't have the knowledge it warrants us to introduce the theme provided it is age appropriate.(27)	100 %	NIL	When we discuss in the classroom or if there is an incidental learning it is good to enlighten the children by further going in detail in the topic (27)	TEx: 1.5yr STn:4-5yrs Peervan Afrose Sulthana
28	70%	There is more than half of the class who are unfamiliar to the topic. A new topic may attract better attention from the children. If most of them have prior knowledge, the lesson may seen boring and meaningless for the children(28)	50%	Those children who have prior knowledge can give better ideas/suggestions while participating in the lesson. When questions are directed at the class, there will be response from those children who are more familiar with the topic.(28) For the teacher, it will be less tedious to teach as more attention can be focused on the 50% who are unfamiliar rather than the whole class☺ (28)	Ask student to give examples or share any information that they know on the topic (28). Ask students to brainstorm/ think of words that are related to the topic (28)	TEx:1 yr Stn:2-4yrs Yvonne Lim Hui Lingi
29	50%	I believe that the children will be more interested in a topic they are not familiar with (29)	80%	In a real classroom I'm expected to follow a lesson plan. A teacher is not given the flexibility to change the prescribed lesson(29)	Through prior questions put to the children regarding the theme/concept (29)	TEx:1yr Stn:3-4 yrs NoorJohan d/o P.K. Ibrahim
30	10%	As some of them do not understand but can input some knowledge to them through listening can be of some influence to enhance their interest(30)	10%	As minority do not know but majority they have some ideas and can be carry out in class. So those minority can learn or being attracted by child demonstration instead of teacher teaching(30)	When students do not know what to share or have not come across (30)	TEx: 2yrs Stn:3-4yrs Mindy
31	20%	I feel that even the minority should not be left out and should be aware of the theme (31)	40%	Lessons will be bored for the rest of the student who are aware of the theme/topic. However, during naptimes new themes could be taught to the students who have insufficient prior knowledge (31)	To talk and have classroom open discussions (31)	TEx: 2 yr Stn:4-5 yrs Nesh
32	40%	More than half the class does not understand and they need more reinforcement to achieve the learning objectives (32)	60%	More than half the class needs more reinforcement however lessons may bore the other children perhaps different approaches can be used. Different activities.(32)	For e.g. completing worksheets, solving sums, having problem in the literacy corner (32) unable to share what they have learnt (32)	TEx:2 yr Stn: 2-6 Zoe

33	20%	20% is half of the class not knowing. As long as there are a handful of children who do not know it is necessary (33)	10%	Given the tight timetable or schedule sometimes if majority knows then should not waste time teaching(33)	Ask them questions (33) or do an activity with them to find out (33)	TEx: O Stn: Shawn
34	NIL	NIL	30%	I believe that learning should be student-centric and not teacher-centric. I believe there are many ways of learning ie group work, role playing, practicals , project work. (34) Moreover, I emphasized on peer-peer teaching. Therefore with the remaining 70% knowing the peers who have prior knowledge can reach the ones who don't This also constitutes the process of 'scaffolding" the children's education (34)	Mainly through class interaction. It is always important to build rapport with students such rapport open up students to be honest with the teacher regarding their understanding et a. (34) Besides rapport, topical test (surprise) could be given. The emphasis is not on passing/failing the students. Rather it is about finding out more of their knowledge in regard to the subject at hand. (34) Finally communication with previous teachers who have taught them could also give a glimpse n the children's understanding (34)	TEx: 12 mths Stn: 12-15yrs Mohammad Fauzil Bin Mohd Taha

WHEN SHOULD TEACHERS TEACH NEW MATERIAL? QUESTIONNIARE SURVEY RESPONSE 34 PRESERVICE RESPONDENTS: NIE						
No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out children's insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	5%	I will remediate this 5% which is equivalent to 1 or 2 students (1). I will have to scaffold their learning experience to suit their needs individually *Small group teaching(1)*	10%	I will have to proceed to follow the requirements of their assessment. This is to enable a homogenous treatment of topics taught within the level (1)	I will do a recall activity at the tuning in or the start of the class. I will select the weakest in understanding of the students in class and the most knowledgeable of student in class to establish a baseline (1)	TEx: 13 mth Stn: 7-8,9 & 11 Salim Bin Hassan Basalamah
2	5%	Not all children would be able to grasp a concept/theme in the desired time as every child has a different learning abilities (2) Philosophy	20%	In a real classroom situation, there are more children that are incapable of grasping a new theme/concept as compared to a hypothetical situation(2)	They are not able to complete the follow-up activities(2) They are not able to complete assessment related to topic/theme/concept(2)	TEx:3yrs Stn: 8-9 yrs Muzaiyanah Bte Mohamed Ali
3	50%	If half the class is not familiar with the new topic, the other half can help in the guidance of the new topic after my lesson (3) Peer Teaching	80%	In reality only a high percentage of students who do not have prior knowledge will be keen and pay attention in class time (3)	Pose questions regarding the new topic(3)	TEx:1.5 yrs Stn:8-9 yrs Nur Hasinah Binte Mohammad Sidek
4	20%	It would be easier to teach the 20% in a smaller group if needed (4)	50%	It is the real situation and if a topic needs to be honoured then at least 50% of the class should be able to grasp the concept then peer teaching would be used (4)	A simple questionnaire or mini quiz should allow me to have an idea of how much they know and where I should begin (4)	TEx:2 yrs Stn:5-9 yrs Nadirah
5	15%	I feel that all the students deserve to be taught (5) and if less than 15% do not actually know, I'll let the 85% start on practices while I teach those who have insufficient prior knowledge (5)	20%	We do not have much time for the syllabus so it is really difficult if we have to wait for so many students (5)	I will ask them questions that are related to the topic to see how much the class knows than get them to raise their hands(5)	TEx:1yr Stn: 7-8yrs Chen Shuyi

6	20%	It serves no purpose to teach a new topic when most pupils already know the content (6)	50%	Many pupils attend tuition class and they are exposed to new knowledge. Therefore it is common for young children to develop new concepts in an early stage (6)	From their assignments I will know the basic foundation of the pupils (6)	TEx:1 year Stn: 8-9 yrs Tan Zu Xian
7	50%	The other 50% who has sufficient prior knowledge would be able to peer teach their friends who has insufficient prior knowledge (7)	75%	It needs to be covered in the syllabus and remediation can take place to help these students achieve the learning objectives of my class (7)	Through continual assessment informal and formal assessment (7) as well as continuous observation(7)	TEx:1 yr Stn: 6-9 yrs Erwina Affandi
8	70%	They might be interested to learn new things (8) Children's interest	80%	I feel those with insufficient prior knowledge tend to discover and make an effort to know what the new topic is (8) (Philoso)	Through enquiries (8)and the way they drew (8)	TEx:4 years Stn: 2-14yrs Azrinawaty
9	0%	The lower the percentage the easier it is to move on to the next topic (9) Management Issue	10-15%	In a real classroom situation not everyone will be able to grasp the concept and due to time constraint we need to move in order to be in line with the school's system (9)	Ask them if they know anything about the new topic (9)	TEx: 3 yrs Stn:7-12 yrs Chiok Xue Ting Sandy
10	5%	Children of 7-8 yrs require a strong foundation so as to better understand the new concept to be introduced (10)	10%	The children that cannot catch up will require closer attention & revision. Hence carry on with the new topic for other students would not hinder their progress and momentum (10)	They are unable to complete classwork (in terms of showing correct working steps, reasons) not so much of time factor	TEx: 13 mths STn:7-8 yrs Chong Qian Min
11	5%	Majority of the class must be able to move on from what I'm about to teach them instead of being left behind confused(11). This is only achievable if most of the students already have sufficient knowledge.(11)	15%	There are bound to be students: lagging" behind want to make sure that everyone is on board before I move on.(11)	By daily work (11) and questioning techniques (11)	TEx:1 yr STn: 8-9 yrs Ho Qian Hui
12	80%	Some kids head to be able to open up their horizon on drawing skills, however some percentage of 20% has acquire the basic drawing skills elsewhere	50%	In some cases not all children can draw well. In this case, some children are gifted and can draw beyond their observation analysis when they look at something before they draw	By giving them a selective theme and analyze the meaning of what they are implying on the drawings. With students with insufficient knowledge they tend to be meticulous on what they draw that's what I felt (12)	TEx:4 yr STn: 6-9 yrs Nur Aishah B. Ibrhim Falli

13	5%	I would not want to neglect too many of the students just so that I could finish with what I am doing (13). But in some circumstances I am willing to move on when 5% of them are still unable to grasp my teaching(13)	10%	Sometimes due to time constraint I would still have to move on. The 10% of the students can be called upon for extra classes with me (13)	When they are unable to answer questions thrown to them or they are unsure of what is expected from them (13)	TEx:8mth STn: 8-9 yrs Nurul Asyhikin Bte Samsudin
14	50%	If it's a new topic, pupil will have a new knowledge and idea as I will give an introduction first to the first topic in addition, taking the risk to teach them something new (14) Gain New Knowledge theme	30%	It is difficult to teach if pupils have insufficient prior knowledge. Nonetheless, it's possible to try out.(14) Philo	Vague answers, unsure about what they are doing(14)	TEx:1 yr STn: 8-9 yrs Shafarina Shafie
15	25%	In a class of 40; 25% would be 10 kids and though it's just a quarter, it still matters(15)	25%	If it's just a handful, they might just be the weaker ones. But if ¼ of the class doesn't understand it would not be a matter of being a slow learner (15)	Discussion prior to intro of topic. Example the topic of multiplication – I would first ask if they know what it is and get a show of hands how many know what it's all about (15)	TEx:1 yr STn: 7 yrs Liane Joy Nonis
16	50%	It is at least half, one half of the class is able to help out the other half who has no prior knowledge (16)	20%	In actual scenario it is not practical to move on teaching if more than half does not understand the current topic (16)	Through class test(16), questioning during class discussion (16), work completed in work book (16)	TEx:1 yr STn: 7 yrs Donna
17	40%	Even though the 60% of the cohort already know the concept the other 40% still do not know	0%-40%	Same as above education shouldn't be exclusive (17) Philo	Familiarity with topic intro (17)	TEx:1 yr STn: 6- 7 yrs Sakihah
18	5%	The 5% of the children can be taught with more attention by the teacher (18)	10%	There is a lack of time for the teacher to teach the needed academic modules with the hypothetically ideal situation (18)	Diagnostic tests(18), dip sticking; testing through questions (18), school work & corrections	TEx:13mths STn: 9-12 yrs Nina
19	10%	Majority of them have sufficient prior knowledge, while the rest are doing exercises on the new topic, I'll be able to let the 10% fill in the gaps for their prior knowledge so they can catch up (19)	10%	My reason would be the same like the top: Majority of them have sufficient prior knowledge, while the rest are doing exercises on the new topic, I'll be able to let the 10% fill in the gaps for their prior knowledge so they can catch up (19) Management	Do a tuning in exercise to trigger their prior knowledge see how many are able to answer at least 90% if the exercise right (19)	TEx:1.5 yr STn: 6-7 yrs Nurzaridah Masnam

20	5%	As long as majority of the class understands I can allocate outside time to coach the 5% of students(20)	10%	It is difficult to focus class time on just the 10% of the children. The other 90% would thus find the lesson boring and not useful (20)	Perhaps, before starting a new topic I would question the children about what they know about the topic. Based on their responses, I can gauge their knowledge of the topic (20)	TEx:1 yr STn: 6-8 yrs Brammi Ragupathy
21	30%	Without the fundamental knowledge pupils may find it more difficult to cope with the subsequent topics taught (21)	50%	To meet the schedule given.(21)	In class work, assessment (formation/summative)	TEx:17 mths STn: 7-8;11-12 yrs Athena Wee
22	10%	In an ideal situation it would be ideal to have almost everyone in the class to have sufficient prior knowledge which will make the lesson easier to be delivered and the lesson objectives sufficiently met. Prior knowledge is important to unpack a new concept more effectively (22)	5%	Even though prior knowledge is important. It does not mean that it is an obstacle to learn a new concept. There is always a start to everything. They just need exposure (22)	I would have children to share their thoughts and experience about the topic. This can be done through interactive discussion or maybe a questionnaire (not written but verbal where they can just raise their hands to indicate yes/no). I would include my experience too by giving real life examples to get them started	TEx:5 weeks STn: 8 yrs Aisah Jasmun
23	10%	I would like the class to learn together and try to get them on the same pace (23). For the few who have insufficient knowledge they will be able to gain new knowledge through this lesson and through their friends. For those who already have prior knowledge they may be able to gain additional info or look at it in different perspective. It can be a practice for them (23)	20%	In a real classroom situation, there may be time limit due to examinations etc. If only 10% of the class have insufficient knowledge they can form a small focus group to teach the new material. Instead of learning as a whole class 20% would be more substantial for whole class teaching (23)	Test (23), practice, questions(23)	TEx: student teacher Tan Shi Qi
24	20%	20% of a class (which is approx 8 students) are too many for me to teach 1 to 1. I would prefer to teach it in class instead and get the better students to help out as well (24)	10%	The foundation of the topic should be grasped well in order to progress to next topic (24) Philo	Through daily work (workbook, participation in class etc) (24)	TEx:6mths STn: 7-8 yrs Nurfarhana Eniza
25	10%		10%	If the percentage is lower, it is easier to manage. If a large percentage of the class has insufficient knowledge, the new	When they do not show their understanding in their artwork(25)	TEx:nil STn: 7-8 yrs Gina

				concept might require previous knowledge and it will create a greater misunderstanding (25)		Chai J. Y
26	90%	Most of the students may not have the knowledge and teaching a new topic would get them to be engaged and interested in class as it is something new (26)	60%	Most concepts/topics are linked to one another students are required to have some prior knowledge before they can go onto the next level (learning a new topic) (26)	I would ask them questions find out what they know or do not know (26)	TEx:NIL STn: NIL Celina Soh
27	70%	Prior knowledge is somewhat important to link concepts and get students to familiarize with the new topic.(27) Prior knowledge does not necessarily mean things they have studied before in school, it could be things *they are exposed to in their life*	60%	It will be easier to teach and let students relate to the topic (27)	Through formative and summative assessment (27)	TEx:NIL STn: NIL Salbiah Binte Ishak
28	80%	The percentage shows that the vast majority of the pupils are unaware of this topic. It will increase my motivation to teach them something new (28)	50%	Prior knowledge is important in a real life classroom. Realistically we don't have time to teach from scratch. Thus the percentage. (28) Phil	Activation of schema, relating the topic to them and get them to respond then assess the response and see if they possess prior knowledge about the topic/theme/concept	TEx:6mthsr STn: 10-12 yrs Lin Simin Agnes
29	10-20%	I would teach and reinforce the concept to ensure that the whole class reaffirms their knowledge. As for those who did not have the prior knowledge it will give them added value (29)	10-20%	Teaching new concepts is only a matter of few minutes but the value/knowledge that these 10% gain will be of added value. In addition the rest 90% of the class will get to see a different perspective and glimpses of that same knowledge/concept (29)	I would pose questions, use pictures to draw out their experiences. If they are unable to answer, it might indicate a lack of confidence in the topic and hence reinforcing the concept would be ideal. This way students are able to reaffirm the knowledge building on to their pre-existing notions of the concept(29)	TEx:1 yr STn: 3- 6 yrs Nurul Huda Jalali
30	10%	In a class of about 40 students, this percentage would translate to about 4 students, whom I can pay extra attention to more easily while the rest would be able to cope on their own (30). A larger percentage would equal	10%	I feel that the hypothetical percentage and reason I state above is practical in a real classroom situation: In a class of about 40 students, this percentage would translate to about 4 students, whom I can pay extra attention to	A sharing session where students talk about their experiences/knowledge of the topic/theme/concept (30) and a preliminary sketch of ideas which students would explore in the final drawing would give a good gauge of the students' knowledge or	TEx:2mths STn: 8-10 yrs Hema Devi Utrakumaran

		to too much to handle and a smaller percentage would mean that more students would feel less challenged (or more bored) with the topic (30)		more easily while the rest would be able to cope on their own. A larger percentage would equal to too much to handle and a smaller percentage would mean that more students would feel less challenged (or more bored) with the topic (30)	lack thereof(30)	
31	20%	It is important that all students must be taught of the new topic/concept so that students can work as a class in learning knowledge. (31) The rest of 80% students who already knew should sit through the lesson and treat it as a recap or revision and allowing them to clarity any doubts regarding the topic	20%	Since I have selected 20% in the ideal situation it is fair enough to practice it in a real classroom situation	Through Q & A,(31) assessments, tests (31) homework worksheets(31),	TEx:NIL STn: NIL Joyce Tan
32	0%	I will want to ensure that my students have grasped the previous knowledge before moving on to a new concept (32)	10%	Of the limited time that I have in the class to complete all my teaching and to have remedial classes for the weaker students to help them with their foundations (32)	Through my assessment of their written assignments(32)and also through verbal questions/quiz asked in class (32)	TEx:6mth STn: 6 yrs Hasyimah Bte Harith
33	30%	The 30% would account for at least 12 students out of a class 40 and it is quite a large number sometimes even if they already know the concepts they might forget or understand incorrectly/differently, hence there is a need to refresh their memory and apply efficiently (33)	40%	Of the time constraint to finish things of the syllabus.(33) 40% is a large number – almost half the class hence there is a need to teach it. (33)	Through test, assessment, (33) responses in class(33), , reflections	TEx:1 yr 5 weeks STn: 7-8 yrs Izyan Binti Wahid
34	80%	Since majority of them has insufficient prior knowledge there is a need to provide some to start the new topic (34)	90%	Nearly the whole class do not have prior knowledge of the topic, so it is a need to teach them and give them some background knowledge as a start. (34)	By asking questions on the topic and see the amount of response by the students (34)	TEx:6mths STn: 1-12 yrs Nur Hidayah Amaliah

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
32 PRESERVICE RESPONDENTS: AFO2

No	HYPOTHETICALLY in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		In PRACTICE in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out about children's insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Q3. Reasons Given:	
1.	70%	It is majority (HPO)	30%	The students with insufficient prior knowledge is minority (REAL)	Just by guessing	TEx: 1 yr Stn: 5 yrs Joy Wang
2	90%	I want them to learn more effectively through insufficient prior knowledge (HPO)	80%	It is more practical (REAL)	Firstly, check standard development milestone. Since every child develops different pace, at least a gauge if the child is within the milestone. Do lots of observation and compile all documents/findings of child and constantly evaluate to find out child's insufficient knowledge.	TEx:1 Stn: 4-5 Noorazlin Binte Ibrahim
3	10%	It is easier to help the 10% to catch up with the rest. We can give more attention to the small group to cope. (HPO)	20%	It is still manageable to help the 20% as they can still learn at the same time with the rest of the class. (REAL)	We could ask questions to check their respond. We could play relevant games to observe how much they know about the topic.	TEx: 11mth Stn: 4yrs Lew Yen Hoon
4	10%	For these children who can't grasp the knowledge, I'll spend individual time with them aside from the lesson time. (HPO)	10%	I need to fulfil the lessons that I have planned for the week. I'll spend personal time to help the children who cannot understand to help them catch up (REAL)	• From their conversations with their friends • Using daily experiences to teach them and question them to see how much they know about their surrounding • Have chn to share about the topic discussed to identify their prior knowledge • Have chn to share about their experiences and ask them questions from there.	TEx: 11 mth Stn: 5 Joanna Lee
5	70%	If such a high percentage of children do not know about this topic, it will be good to teach so that they gain new knowledge	40%	It will be difficult to teach about something completely new to them in such a short period of time (REAL)	Have interactive sessions with the chn. Through question and answer we will be able to find out the depth of their knowledge.	TEx:1 yr Stn: 2-3 yrs Menaka

6	5%	I want to teach a new student when all the children have the prior knowledge. I do not want any children to stay behind (HPO)	20%	It is my childcare's practice moreover I need to do teach them new topic even though they do not have prior knowledge as the parents want the teachers to teach the children new topics every time. (REAL)	Give them some activities and see if they are able to do it or not.	TEx:1.5 yrs Stn: 5 yrs Durgadevi
7	10%	The number of children who had insufficient prior knowledge will only be 3 out of 30. Thus the 3 children can easily catch up with the lesson if the teachers spend free play time to teach the children, lesson. (HPO)	5%	I do not wish to repeat the lesson if the children already have a good grasp of knowledge. If I could teach properly in a lesson then it is better than repeating lesson that does not make an impact in the child. (REAL)	When the chn is unable to express their thoughts on what they have learnt, I felt that, that's when the chn have insufficient knowledge.	TEx: 1 yr Stn:2-3yrs Nuramalina Binte Hassan
8	10%	Its an appropriate amount for teachers to focus on when they need help. (HPO)	10%	.Its an appropriate amount for teachers to focus on when they need help. (REAL)	Based on the way they behave, communicate amongst one another tells alot about chn's insufficient knowledge.	TEx:1 yr Stn:4-5 yrs Najibab Mohamed
9	10%	Example 10% of 30 children will be 3 children who could be taught from the basic and build up the prior knowledge (HPO)	10% 9	Example 10% of 30 children will be 3 children who could be taught from the basic and build up the prior knowledge (REAL)	Ask questions to find out how much prior knowledge they have	TEx: 1 yr Stn: NIL Anish Fathima
10	10%	It is an appropriate number for us to concentrate on the children who needs help (HPO)	10% 10	It is an appropriate number for us to concentrate on the children who needs help		TEx: 11mths Stn: 3-4yrs
11	90%	I would like my students to gain new knowledge. 10% of 20 students is 2 students who have prior knowledge. So, can still afford to ignore the 2 and teach the rest. (HPO)	80%	Some students would have more exposure. Hence, must factor a higher probability of children who knew (REAL)	Thru communication, asking chn questions and probing deeper through activities, see if the child is able to respond/understand.	TEx: 10 mths Stn:3-4 yrs Teng Siew King, Christin
12	90%	If would be more meaningful to teach what the children do not know than to teach them what they already know. (HPO)	70%	I can get some children to respond to the questions easier. (REAL)	1. For those older chn, teachers can attempt to ask some questions prior to teaching the topic and assess how much they know about it. After the lesson, teachers can assess their work done as well. 2. For those younger chn, teachers can record and observe the chn in action too.	TEx: 10mths Stn: 3-4yrs June

13	50%	If half of the class is able to learn and absorb knowledge, I think it is fair for those who can learn more. As for slower students I will modify it simpler for them (HPO)	70%	My class varies in terms of knowledge and ability to grasp knowledge. So far only 3 out of 10 students are able to learn things faster. (REAL)	By testing and asking questions to each individual child. Especially to those who are quiet and seldom speak in class	TEx:1 yr Stn: 3-4 yrs Tan JinHui Audris
14	20%	It means that 1/5 of my class does not understand the topic and it is a cause for concern if they can't catch up with the rest of the classmates (HPO)	20%	I would still want the children to understand the topic/theme/concept. This is only possible if I have the time(REAL)	NIL	TEx:1 yrs Stn: NIL Nurul' Ain Bte Ahmad
15	90%	More than half of the class have no prior knowledge of the new topic. (HPO)	50%	Half of the class do not have any prior knowledge. Hence, in a real classroom situation it will be considered quite a lot of children to me. (REAL)	When they are unable to answer my questions. Lack of response from the chn	TEx: 10 mths Stn: 3-4 yrs Kelly
16	80%	The children are not exposed to this knowledge and it is a good time to teach them new concepts (HPO)	70%	I have to consider that some children already have this new knowledge due to enrichment programmes from parents(REAL)	Asking questions, during lesson time, I can assess through their responses to my lesson	TEx:11 mths Stn: 2-3 yrs Ivy Lee Mei Jin
17	10%	The children need to have some form of idea/experience to be able to add on knowledge. Having input from the children is also important to able to gauge if the children is learning. No experience = No quality input= objectives not met.	20%	While I would prefer more children to have some form of prior knowledge time is often an essence and we need to start something new when the schedule needs us to(REAL)	-ask questions about the topic in small groups Leave some activities pertaining to the topic and see who knows how to play/do, and who doesn't	TEx: 1yr Stn: 5 yrs Nur Iyzmawati
18	0%	In theory, we do not want to leave any child behind while we proceed on to learn new things. We want everyone to be ready. (HPO)	50%	There is a fixed curriculum to follow through. Unless majority of the children are not prepared I would be expected to execute the new topic/theme/concept	-by asking chn questions - By asking chn questions differently - by asking chn to ask us questions	TEx:1 yrs Stn: 4-5 yrs Serene Tan
19	10%	Ideally, this is what I hope that it should be. Where most of the students have the knowledge and It'll be easier for me to teach it I do not need to repeat the same lesson again and again which takes a lot of time as we don't have enough time (HPO)	20%	I have curriculum to fulfil observations and documentation to do and submit. It's not the ideal number but we as teachers we don;t have much choices. There are too many children in one class too. Can't accommodate everyone. (REAL)	By observation and asking questions. Get children to interact with each other and observe their communications & behaviour	TEx: 1 yr Stn: 1.5 – 2.5 yrs Iranna Wilianty

20	20%	They should at least have some idea about the topic to fully understand what we're going to teach in class. If children know too much the lesson would not achieve its objectives. (HPO)	50%	Due to the lack of time at least half of the children should know something about the topic to ensure us that the lesson would go through smoothly (REAL)	-ask questions to see their understanding -play games	TEx: 1 yr Stn: 5yr Siti Nadiah
21	80%	Children need to learn new things and almost the new things they learn it from school (HPO)	80%	Children are more interesting in learning new topic (REAL)	- Chn that cannot participate in the lessons. They lack of knowledge and hands-on activities	TEx: 1yrs Stn: 3-4 yrs Herlina
22	90%	Not all children are given opportunity to learn new things. Parents are busy. Teachers should teach new things. (HPO)	90%	Most of the children are not taught things at home. (REAL)	We will be able to find out through children's responses. We usually would introduce a new concept in a sharing session. LEA we can gauge the children's knowledge in that topic.	TEx: 1yr Stn: 3-4 yrs Mahmutha Begum Ismathinoon
23	90%	The children would be more interested and willing to participate in the activities etc. (HPO)	80%	For the ones who had prior knowledge it would serves a form of reinforcement too. (REAL)	It can be through games etc. where you can then see if they understand the overall concept? E.g. if you're teaching about different materials, you can do a sorting example to check/ensure that they understand	TEx: 1 yr Stn: 3-4 yrs Jas Chen
24	50%	Of 50% knows, it means the other 50% are able to comprehend but had insufficient prior knowledge because they are not exposed to it. (HPO)	50%	I feel comfortable and believe it is easier for understanding to occur. (REAL)	-asking chn relevant questions and see if they are able to response or give the correct or wrong answer	TEx:1 yr Stn: 3-4 yrs Ong Ai Ling
25	70%	I think it is important for me as a teacher to ensure that majority of children know the topic (HPO)	50%	It is essential that children have the basic knowledge of a topic (REAL)	By questioning them, watching them at play and observing the ways they try to solve problems	TEx: 1 yr Stn:4-5 yrs Jayakumar Vijaya Sree
26	50%	If half the class is aware and they understand the topic those who don't understand can ask and learn from them.They can pair up and teach each other. (HPO)	10%	I want to ensure that all the children understand the topic well before I proceed to other topics. (REAL)	- Ask questions - Provide follow-up activities to test their understanding	TEx:NIL Stn:4-5 yrs Melinda Chew
27	50%	All the children need to be given an opportunity to know what their peers might know or understood (HPO)	20%	I believe that all children should be given an opportunity to learn and those who know the topic may learn something new. (REAL)	By asking them questions to verify if they have sufficient knowledge about the questions being asked.	TEx: 1yr STn: 2-3 yrs Yasmin Saui

28	10%	It is not always the case that every child has prior knowledge with 10% who is insufficient of knowledge, we can teach the other ideally and give more attention to the balance 10% (HPO)	20%	I believe that 20% of children without prior knowledge can try to pick up when I teach a new concept. We have to try push children to the limit. (REAL)	When we have small group activities(doing work which is rich in concepts taught) Child may stare blankly not knowing what to do. Does not understand concepts despite repeatedly teaching her on one to one basis Use other mediums to teach and looking at her behaviour (lost of interest)	TEx: 1 yr Stn:3- 4 yrs Wahanian
29	50%	Those who have the knowledge can pair up with those who do not have the knowledge and help them with the new topic (HPO)	20%	Those who have the knowledge will not be left out and will teach those who do not have the knowledge in small group (REAL)	Thru asking of questions and doing of activities	TEx: NIL Stn:3- 4 yrs Frances Ye
30	75%	There will be some children who will not be able to cope in terms of cognitive development we should cater for the majority (HPO)	75%	There will be some children who will not be able to cope in terms of cognitive development we should cater for the majority (REAL)	Their lack of response, inaccurate answers, unable to perform in their work etc.	TEx: 1 yr Stn:5-6 yrs Clarissa Lee
31	50%	If majority of the children had insufficient knowledge it is ideal to teach so that the whole class may proceed to the best advance level together if percentage is less than that, individual coaching may be employed (HPO)	10%	I want to make sure all the children know about the topic. For those who have learnt about the topic sometimes they will want to tell others of their knowledge. This reinforces the concept and children who not know may acquire the knowledge through their peers. (REAL)	Through questions and activities when learners ask, we know they have insufficient knowledge when they cannot answer when children ask us a question or the question we asked, we know they have basic knowledge and want to find out more.	TEx: NIL Stn:5-6 yrs NIL
32	20%	For this age group they are still young so teachers need to spend more time with them to let them fully understand the concept (HPO)	35%	It will be unfair to those to who already have the prior knowledge and parents are very demanding nowadays. (REAL)	By asking questions, observations and the way they did their homework and the errors that they make	TEx:NIL Stn: 2-3 yrs NIL

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
38 PRE-SERVICE RESPONDENTS: DTEF02

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out children's insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	30%	If I have 15 children in the class, only 4-5 children would not be able to understand. Therefore, at least more than half 70% of children have understood. (HYPO)	30%	S If I have 15 children in the class, only 4-5 children would not be able to understand. Therefore, at least more than half 70% of children have understood.	Through asking questions, I am able to find out about children's knowledge	TEx: NIL Stn: NIL Nuraidahfitri Ang Bte Ahmad Hussein
2	10%	I can run through with the 10% of children after I taught the 90% of children whom already familiar with the topic(HYPO)	10%	10% is not a large number and as teacher I can work with 1 to 1 teaching method thus the majority can benefit with the new knowledge (REAL)	When chn are not able to answer when questions asked?	TEx: 15 mths student teacher Stn:-5yr Neo Hai Yen
3	30%	30% of 20 children is 6 children when 6 children in my class does not know the particular topic, I will continue teaching it. I believe that with time constraint in a preschool it will be difficult for me to teach the 6 children separately. Moreover, a topic will take a longer time. In addition it is my duty as a teacher to teach the children to their fullest. Hence I will do my duty. The other children who have knowledge on the topic will just learn more. (HYPO)		NIL	Through assessments. I will observe them closely after asking them age-appropriate questions	TEx:NIL Stn: NIL Sanam Budhrani
4	10%	The 90% of the children should move on as they will get bored/uninterested if I continue teaching the same thing. However, I will continue to focus on the 10% and coach them individually. (HYPO)	20%	In practice, the school has a curriculum to achieve. (REAL)	First of all, teachers have to be aware of the developmental stages of the chn, then observe & assess the chn during their play time & lesson time. Thereafter ask questions pertaining to the lessons/theme that chn learnt to find out their knowledge gain.	TEx: 1 yr Stn: 4 yrs Jasmine Leong

5	10%	I want to reach out to every child in a group setting(HYPO)	30%	It may not be fair for the other children as it will slow down their learning (REAL)	Asking questions during tuning in through observations	TEx: Once weekly attachment for 1 year Stn:4yrs Tan Siew Eng Christine
6		NIL	5%	It's important for the majority to have a grasp on the knowledge where the special 5% will go through one-to-one guidance (REAL)	I find out by asking questions, voicing problems pertaining to their knowledge to ask for their inputs	TEx:NIL Stn: NIL Nursyafiqah Hamdan
7	20%	NIL	10%	It is fair if all the children would grab the knowledge and move on together (REAL)	By asking questions and observing them	TEx: NIL Stn: NIL Wan Nur Fatin Binte Wan Idris
8	30%	I feel that children learn best through their peers.If majority of the class understands the topic I could get them to explain/teach it to their friends which would lighten my work load & promote interaction & peer learning between children. (HYPO)		NIL	I will find out by asking questions about that particular topic	TEx:NIL Stn:4-5 yrs Dinali Naomi Wickramanayake
9	10%	Prior knowledge is important to link to achieving the objective in the lesson plan(HYPO)	20%	Prior knowledge is important (REAL)	Through our oral questioning and observation Through children's work either project or written work	TEx:30 yrs Stn: 5-6 yrs Lim Quee Seng
10	20%	With the 80% of the class will help to push those weaker ones in class. Hopefully it will also allow children to learn from one another. (HYPO)		NIL	Through daily communication and lesson	TEx: 1+ y Stn: 3-4yrs Lim Hui Ting
11	50%	Irregardless the children need to learn new topic. (HYPO)	10%	Every child needs to learn (REAL)	They do not know how to answer questions posed by the teacher	TEx: 1 yr Stn:4-5 yrs Jenny Lim

12	25%	As a reflective teacher there is always room for improvement. As assessment and evaluation is an ongoing process(HYPO)	20%	Children learn through assimilation and accommodation. Learning is a process and a journey (REAL)	Ask questions, through demonstrations & observations	TEx: 1 yr Stn: 5-6yr Ivy Ho
13	60%	I have to focus on the majority. If only a minority don't know I will proceed with the lesson. For the minority perhaps I will give extra lesson to them. (HYPO)		NIL	By asking open-ended questions Allow them to learn through play	TEx:NIL Stn: 4-5 yrs NIL
14	10%	It is easier for me to meet the objectives that I have set for the children. I can get positive responses from the children. I can scaffold their learning further. (HYPO)	50%	Each child is unique and each acquire knowledge differently when the children do not know the topic more discussion and interactions between peers and teachers will occur. (REAL)	Firstly, I must have sufficient knowledge to assess whether chn have sufficient knowledge or not. So teachers must have all the knowledge in the subject area in order to teach effectively.	TEx:NIL Stn: NIL NIL
15	10%	If more children have the sufficient prior knowledge, it will be easier for the child as they are more familiar for the insufficient learners their friends can help them to learn(HYPO)	30%	The children can learn new things for their everyday life (REAL)	By observing their behaviour and participation in every activity	TEx: NIL Stn: 3-4 Yrs NIL
16	5%	5% is only a minority percentage. I would go on to teach the new topic but also ensure that the 5% still continue to learn the previous topics till they achieve the learning objectives. (HYPO)	10%	In reality we can't wait for all the children to finish mastering a skill etc. 10% would be my limit (REAL)	I feel by asking questions, by observing chn, we can find out if they have acquired the knowledge	TEx:0 yrs Stn: 2-3 yrs Charmaine Ho Han Yan
17	10%	I think I can teach this 10% of the children during small group session(HYPO)	20-30%	Every child learns in their unique if I have 70-80% where children understand the new topic I would consider it as a success. (REAL)	Thru' interaction and individual checklist of the theme	TEx: 1yrs Stn:2-3yrs Lina Gan
18	NIL	NIL	50%	I feel that we should not short-change children in their learning and perhaps adopt another teaching method/strategy to teach the new topic/theme/concept (REAL)	By observing the children Asking questions	TEx:1 yrs Stn: 2.5-3 yrs Xu PeiTing

19		NIL	15%	I need to take into consideration to the remaining 85% of the children which is made up of 17 children (assuming a class of 20 children) I will get the 3 children who are unable to achieve the objective to do something which is somewhat linked to the new topic.	Through asking questions Chn react in a restless way	TEx:1 yr Stn: 3-4 yrs May Kong
20	100%	It is a new topic and all the children learn together (HYPO)	100 %	It is a new topic and the children do not have any prior knowledge, therefore I have to teach from the basic. (REAL)	When the teacher asks questions and find out they don't know. Being young, there are chances they don't know alot of things. So only when we talked about it and share than only we realised that they have insufficient knowledge	TEx: 2 yrs Stn: 5-6 yrs Susan Chong
21	10%	The lesser the percentage the easier for me to teach the new concept (HYPO)	20%	I feel that 20% is manageable as there are 80% who already have some prior knowledge (REAL)	Through interacting with the chn by asking them questions	TEx: NIL Stn: 3-4 yrs Irene Tan lee Keng
22	50%	Children are able to learn as they go along. They learn at different pace (HYPO)	30%	Children are able to learn as they go along. They learn at different pace (REAL)	During interaction with them, it is obvious the chn do not know the difference between the types of movement	TEx: 120hrs Stn: 6+yrs Jean Tan Siew Chin
23	80%	My teaching will be beneficial to the majority of the class (HYPO)	20%	If the curriculum is compulsory and has to be followed religiously (REAL)	During the tuning in when teacher asks questions to know about the prior knowledge of chn. Conversations with chn which they related to their experiences.	TEx: NIL Stn: 4-5 yrs Evelyn Chan
24	70%	I felt that the children will have opportunity to learn. Even for the other 30% I can extend their learning (HYPO)	10%	There is a standard theme of the center that we need to follow. (REAL)	When we ask them question on the topic, or during interaction with the children	TEx:NIL Stn: 5-6yrs Kan Maisy

25	20%	20% of children is a safe number and teachers can use a little extra time to give special attention to them (HYPO)		NIL	Children might withdraw from class discussions when they lack knowledge they would also not talk to their friends and be very quiet.	TEx: 1 yr Stn:3-4 yrs Guganesnwari
26	30%	I feel that as long as the tuning in offers sufficient insight plus the main activity they should be able to catch up and follow the class (HYPO)	20%	I feel that I can be able to spend time aside to follow up and explain with this group on a 1-to-1 basis (REAL)	By asking questions	TEx:1 yrs Stn:4-5 yrs Cham Carina
27	30%	Most of the students understand the topic well (HYPO)	50%	There are a few children who knows and there are a few who do not know (REAL)	Through questions and parent sessions	TEx: 6mths Stn: 4-5 yrs Chen MeiXiu May
28	20%	It is a hypothetical situation (HYPO)	80%	it is a real classroom situation and support of the teachers, parents and children. Thank you (REAL)	In the classroom environment, if there is silence, it could show that the chn have no questions to ask.	TEx: attachment 1 yr Stn:4-5 yrs Lim Gek Choo, Veronica
29	80%	Most of the children could move on (HYPO)	50%	The curriculum schedule and syllabus to cover is not determined by the teachers. As such even if 50% of the children have no prior knowledge the lesson must proceed due to meeting the schedule (REAL)	Through observation and interaction with the children	TEx: attachment Stn: 4yrs Wong Peng Peng
30	20%	Allow more time for the 20% of the children to catch up (HYPO)	30%	In reality there is so much to teach short period of time. Thus, lesson will proceed despite the fact that there is a group of students who aren't able to follow (REAL)	By asking questions, by observations	TEx: attachment Stn:3 – 4 yrs Ting Jing Jing
31	70%	It is important for children to learn the new topic/theme/concept. For those who already have prior knowledge they can share their knowledge (peer learning)	10%	It is part of the course curriculum of the school to teach the children which is compulsory. (REAL)	By asking them questions	TEx: NIL Stn:4-5 yrs Rachel Ho
32	70%	Every child develops differently and as such using lots of new materials to teach them is very important. (HYPO)	80%	Children learns best when they see and feel new materials (REAL)	Appropriate questions, observations & assessment	TEx:3 yrs Stn: 3-4 yrs Florence Jeremiah

33	20%	It allows me to allocate more time to focus and scaffold the children with difficulties (HYPO)		NIL	We will have observed the children for a period of time & when executing the lesson, tuning in, we can ask a few questions to see if there is insufficient knowledge.	TEx: 1 yrs (every fri) Stn: 2-3 yrs Li Shuyi Joyce
34	90%	It provides a platform for me to share with children on this particular new topic. Due to insufficient prior knowledge it will in fact an opportunity for me to teach them and create awareness on this topic. (HYPO)	95%	To me it is a good chance to impart knowledge and expose new knowledge to the children (REAL)	By asking questions promptly	TEx:NIL Stn:3-4 yrs Vanisse Ng Su San
35	30%	We could give separate coaching to the 30% (which is around 5 of them). Further, the 70% could help to lead the 30% during the group activity (HYPO)	30%	We could give separate coaching to the 30% (which is around 5 of them). Further, the 70% could help to lead the 30% during the group activity (REAL)	Thru' communication & observation	TEx: 200 hrs Stn: 5-6 yrs Stacy Tay
36	10%	Is a small number of children that can be group together and go slow on the topic (HYPO)	10%	Is a small number of children that can be group together and go slow on the topic (REAL)	Through observation we are able to assess children's knowledge	TEx: 200hrs Stn:4-5 yrs Suhaia Sayuri
37	60%	I would use another strategy to handle the situation. For example split the group and carry out different activities till both the groups are at the same level and ready to merge. (HYPO)	40%	In school the curriculum states what needs to be taught whether quickly or thoroughly will depend on the class. (REAL)	Ask questions, use assessment tools, observations get to know the child better	TEx:1.5 yrs Stn: 7- 8 yrs Sarita Nayak
38	100% Total 290%	Its alright if children do not have prior knowledge. I can always create an environment and lessons to get them acquainted with the new topic/theme/concept and then move on further with the same topic/theme/concept – simple to complex lesson plans (HYPO)	96-97% Total 271 %	In fact I think a lesson would be more welcome and exciting for the children and purposeful and effective for me if lesser children already knew about it. (REAL)	It can be observed by getting them to play activities using the various skills in different domains and recording them. Once that is done and we move from what they don't know to getting them to know	TEx: 1yr 3 mths Stn: 3-4; 4-5yrs Chandra Trivedi

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
41 Pre-SERVICE RESPONDENTS: DTEF07 1ST NOV 2011

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out students' insufficient knowledge?	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:		
1.	20%	I have experiencing teaching my children about Italy. They do not have any idea what I am saying but when I show them the globe and where Italy is located; they at least have an idea that it is a country, like Singapore. So they start asking questions from here I know what they want to know more. I believed that children have some or at least little prior knowledge (1), it's just that the knowledge is like a part of a puzzle and teachers are there to assist in completing the puzzle. (1)	20%	Children nowadays are more exposed in terms of media. They are also curious therefore when they are introduced to something new, they will never stop trying to figure out what that 'new' thing is (1).	For children n in this age group (5-6 yrs) as above they are able to articulate their needs and wants. Therefore, they will ask the right questions to clear their needs for the knowledge(1).	Nurwana Binte Mod Saleh Tex:1 yrs+ Teach: 5-6 years old
2	100%	NIL	100%	I feel the percentage of children had insufficient prior knowledge is not so crucial as in practice, we have to follow what the preschool is required (2)	The response of the children will tell if they have prior knowledge or not.(2)	Jennifer Teh Tex: 2 yrs Teach: 2-3 yrs old
3	20%	I believe children should not be deprived of any information (3). Children that fail in that percentage also need to have at least the same level of prior knowledge than the rest of them(3). .	50%	Maybe I have to convince preschool administrator the importance and provide a solid reason to teach a new topic/theme/concept (3)	Through interactions during free play or casual conversation with children (3) and during an open-ended questions asked to children during lesson(3)	Salbiah Binte Abdul Rahman Tex:NIL Teach: NIL
4	10%	Every child should have the opportunity/access to the learning/knowledge (4)	0%	If this topic is in the curriculum I feel obliged to teach it (4). Even if the children have some prior knowledge, it is good to re-visit it, enhance their learning or reinforce it.(4)	When first broaching on the topic – ask children what they know: know of, heard of, have any knowledge of this topic (4)	Brig Dharmapala Tex: 4 yrs Teach: 3-9 yrs old

5	10%	I believe as a preschool educator it is my job to cater the topic/concept/theme in an interesting way to children even those who have understand /known this before as we can reinforce further(5)	0%	It is based on centre's/kindergarten's curriculum to deliver the lesson (5)	When I introduce the new theme e.g. 'transportation' children would like to know more, curious about the topic. They asked questions wanting to know more (5).	Angeline Loh Tex:8 yrs+ Teach: prenursery -3-4 yrs
6	50%	I feel that if half of the class of the children are not being exposed to the concept/topic/theme. I assume that the topic must be novel to most of the children, the other half that who are already known will take it as revision and try to master it	90%	I do not miss out any late bloomer and those already know can try to master it (6)	They are not engaged (6) Code: Child's participation	Ling Gek Ngo Tex: NIL Teach: 6-7 yrs old
7	50%	Half the class is new to the topic and need to be taught (7)	50%	All students have the right to be educated regardless of whether they know/do not know the concept (7)	a. No respond b. Quiet and reserve(7) c. Do not participate d. Provide wrong answer (7)	Tan Choon Keow Tex: 6 yrs Teach: 6-7 yrs
8	70 %	I would only want to teach if more children will be interested and be listening in to and taking part in the lesson If they already covered the topic they might be too bored to bother paying attention. (8).	50%	If the percentage is lower than 50% it would be a waste of time and resources teaching something that half the class already know. Time and resources would be better spent teaching a topic that more children would benefit (8)	Have an informal talk with the students before implementing the lesson in order to find out whether the topic is interesting and fun to them and if they have any prior knowledge of it.(8)	Marie-Therese Leong Pon Tex: NIL Teach: NIL
9	50%	It gives a balance percentage to plan my activities where children with prior knowledge can in a way to assist the weaker children to progress Thus moving the weaker ones to a same/similar level of knowledge of concept(9).	90%	The larger percentage of children without prior knowledge allows my teaching to begin from the basic.(9)	By the use of storytelling, bring concrete materials (9)	Janice Loh Tex: NIL Teach:NIL
10	20%	I can tailor the lesson in a way that I can apportion sufficient time to help this 20% of children to be on par with the rest by their peers. Furthermore, 20% is a small percentage and it is manageable (10).	0%	It is part of the curriculum and teachers have to complete the syllabus (10)	At the onset of the lesson, I would normally ask open ended questions and I can gauge their knowledge from there responses (10)	Anisah Binte Shafii Tex:2 mths relief Teach- 6 yrs
11	0%	I believe that even if many children know a certain topic, they may not know it in depth.(11) If they do I will ask the children to help me teach others (11). We will exchange ideas and knowledge with more	0%	Same as above I believe that even if many children know a certain topic, they may not know it in depth (11). If they do I will ask the children to help me teach others (11). We will exchange	Through discussion (11)	Annisa Bte Mohd Amin Tex: 6 yrs Teach 4-6 yrs old

		advance information, both children and teacher will benefit.		ideas and knowledge with more advance information, both children and teacher will benefit.		
12	70%	Children have to be introduced to new material and information in order to have current knowledge). If we do not introduce they will have no prior knowledge. (12	70%	It is still important to introduce children to new material maybe the objectives can be change and be flexible (12).	Talk to them(12), ask question (12) let them inquire (12), research, show them pictures (12) (12) or discuss experiences.(12)	Shweta Bhatnagar Tex: 2.5 yrs Teach: 5-6 yrs
13	20%	I think it is important to ground each child in foundational knowledge often I have also found that prior knowledge of children is incomplete or has gaps. Teaching material already known gives me a chance to fill in the gaps for every child in my classroom. (13);	30%	Despite my ideal of 20% or even 10% in real world situation, limitations of time or regulation are often imposed (13). However, I would still do my best to ensure that each child gains a good foundation in my classroom.(13) Individual children matter (13).	I would use a mixture of formal and informal assessments consisting of question and answer (13), observation of child at work, (13) test/quizzes for older children, examination of child's work and observation/interaction with individual children.(13)	Suzannah Chua Tex:4 yrs Teachr 4-6; 7-11 yrs
14	50%	I feel there should be at least half the class of children who do not have sufficient prior knowledge of the new topic, otherwise the children may not be receptive enough (14)	0%	In a real classroom situation, it is difficult to choose what to teach or what not to each as there is a curriculum to follow (14). If majority or all of the children already have prior knowledge of the new topic I will still teach but I still go into more details and stretch the children's thinking so they will not find the topic too boring.(14)	I would read a pictorial book and ask some questions regarding the topic theme (14), or try out some experiments in class (e.g. for science topics)(14)	Alice Ong Tex;0 yrs Teach: 3-6 yrs
15	20%	The children with insufficient prior knowledge has the rest of the classmates and teacher (me) to help them understand the topic better when he is unsure (15). My lesson would still go on as normal but with variations catered for the 20% (15)	20%	I believe that children will learn if they were given the opportunity to do so. (15) I believe the 20% of children would be able to catch up with the topic if they were taught appropriately.(15)	I would try to introduce the new concept by uninitiated learning experience. For example, if I know that "weather" would be the upcoming theme, I would generally collate recounts from the children to see if they already had exposure of it.	Didi Nuridayu Tex: 6 months Teach: NIL
16	50%	I would think that too low a percentage would mean that the rest of the class who had a good enough knowledge of the concept would get bored and distract the other pupils. Half of the class who had knowledge of the concept can then pair up with those who don't know anything to help them (16).	80%	The children would then pay more attention to what I am teaching and not get bored easily (16) and I might be pressurised to keep to deadlines in the childcare curriculum (16)	By asking them questions prior to the lesson to be taught.(16)	Anonymous Tex:NIL Teach:NIL

17	50%	Prior knowledge in early childhood might only be one of the criteria that the teacher should take into consideration when teaching new materials. Interest and emphasis could be the other reason	10%	I feel that as long as there in interest even if the children has prior knowledge, I could emphasize or plan a different perspective for children (17)	Through chatting with the children also to gauge their interest in the topic/theme (17)	Lim Ai Bee Tex: 1 yr Teach: 5 – 6 yr
18	10%	I believe that children should not be penalised when they belong to the minority (18). Further the way the lessons are conducted could be tweaked to suit the class. For more competent children they could be assigned tasks to help their fellow classmates when a tougher topic is being delivered in class (18).	0%	It is part of the curriculum (18). Further, I believe it is up to the teacher on how he/she would like to deliver the lessons to make it interesting and relevant.(18)	Through daily communication with the children (18)	Seah Sow Wah Tex:6 weeks Teach: 2.5 – 3.2 yrs
19	60%	When more than half are not aware of the topic that is the best time to teach so as to build on their prior knowledge (19)	20%	It is in the curriculum and it is necessary to teach the new topic whether majority knows it or not (19).	By asking questions about a particular topic and if most of them do not get the right answer that's when I know they have insufficient knowledge of the topic	Nur Ainisah Tex: NIL Teach NIL
20	20%	Even if the child know, we can always take it as doing recap with them and challenge them to a higher level (20)	0%	All children should deserved equal chances to learning (20)	-observe them in play and when they interact(20) - do a story telling – prompt them questions (20) Do a survey with their parents	Lee Si Ni Tex: NIL Teach 2-5 yrs
21	20%	I feel that the percentage will be manageable for me as a teacher to provide extra coaching with the children individually when the other children who already know the topic are learning by themselves(21),	20%	Same reason as I feel that the percentage will be manageable for me, (21) as a teacher to provide extra coaching with the children individually when the other children who already know the topic are learning by themselves(21)	Perhaps through their lesser amount of participation in the activities as compared to their more equipped peers because of their lack of confidence and little knowledge to contribute to the topic/theme/concept (21)	Vanessa Lee Tex: NIL Teach; 4-6 yrs
22	20%	Every child has the right to learn new concept (22)	40%	40% is consider high, so there is a need to teach a new concept (22) Majority	When the lesson is carry out, prior knowledge of the children is not there (22)	Peirong Tex: NIL Teach: NIL
23	10%	Every child should be taught individually yet they are learning from their friends continually (23)	0%	It is part of the syllabus and I will build upon the lesson plan (23). I will go through the topic and might move on quickly to something related to build up their knowledge. Or I might give them more hands on activities to solidify their prior knowledge	Questions can be asked (23) Activities carried out (23)	Sarah Lois Yong Tex: NIL Teach: 5yrs

24	10%	It is good enough to help the weaker student to learn and those who are strong to help the weaker student (24)	10%	NIL	1. Having quiz(24) 2. Direct conversation (24) 3. Asking the children directly	Anonymous Tex: NIL Teach:NIL
25	0%	It is <u>only fair</u> that every child should have the knowledge of what is supposed to be taught Ideally, I'd still teach the whole class even though almost everybody has prior knowledge. (25).	30%	I believe if the most of the children are already aware/have prior experience they will teach their friends who do not. Children can learn from one another (25). Teacher only interfere if needed	-ask open ended questions about the topic (25) -introduce topic/theme, gauge responses from children (25) -ask children what they know about the topic/theme/concept (25)	Marianie Mustafa Anonymous Tex: NIL Teach:NIL
26	0%	Although the children may claim to have prior knowledge with regards to the new topic/theme/concept, I believe that the teacher could explore further into the topic and teach the class because it is not assumable that the child knows 'everything' about the certain topic (26).	NIL	NIL	During circle time or during meal times or story times, teachers can hold conversations with students and find out areas where there may be insufficient knowledge of the topic/theme/concept (26)	Anonymous Tex: NIL Teach:6-7
27	50%	More than half the class has no knowledge of the topic/theme/concept	70%	More than 2/3 have no prior knowledge	1. Through questioning (27) 2. Simple concept test 3. Quiz (27)	Francis Lim (MALE) Tex: 6wks Teach: 5-6yrs
28	30%	Because it simply shows more than half of them were affected	30%	Since prior knowledge is of such importance & great influence on children learning capability and process (28)	With close ended question thrown in the class I that number of children were not able to give right answers or respond.(28)	Suyati Bte Supaat Tex: NIL Teach: NIL
29	10%	I believe there needs to be a good foundation before anything is taught in future or for the individual to be able to grasp concepts and group independently	30%	The pressure to perform as a class pushes or hurries me.(29)	By theoretical and practical question (29), experiment activities (29)	Monggur Turnlonek Tex: 5yrs Teach:11-59
30	50%	I feel no matter the child has prior experience I can do activities where he can build on, learn more and can try to expand his knowledge by doing more detail workshops (30)	NIL	NIL	When I start a topic the questions if the child is unable to answer basic, can't reciprocate (30) or getting distracted are the possible symptoms.(30)	Sapna Tex: NIL Teach:NIL
31	50%	It is essential to posses prior knowledge to smooth the learning process if time permits (31), I'll do a one-to-one even enough the ratio is below 50%. I'll do it but not at the	70%	It's more practical to teach when ¾ of the class is unsure.(31) Majority	When children are unable to deliver what is required of them (31) Code: Child's Participation	Foo Pih Yea Tex: NIL Teach:NIL

		expense of other children (31).				
32	30%	It would be unproductive for the remaining 70% to be bored and learn nothing they already don't know. The 30% can be taught outside of this group (32).	20%	Every child has to have the minimum knowledge according to the school curriculum (32)	Bringing up the topic during informal situations and when introducing the new theme (32)	Janessa Tex: 1yr Teach: 5-6yrs
33	80%	If the remaining 20% are unable to follow the lessons the children who are competent can help the weaker classmates (33)	90%	In a real classroom situation, there is a need for teachers to complete a curriculum topic within a stipulated date. (33) Therefore, it is necessary to ensure that the majority of the students are aware of the concepts.(33)	Ask them to share their prior experiences/knowledge, regarding the concept (33)	Vaishnavee Thanabal Tex: 10mths Teach: 1-2yrs; 5-6 yrs
34	40%	I feel that it is difficult to conduct private extra lesson for this amount of student and it would <u>not be fair</u> for them (34) as well as the remaining students if lessons were hindered.	40%	I feel that it is difficult to conduct private extra lesson for this amount of student (34) and it would not be fair for them as well as the remaining students if lessons were hindered (34)	By asking each student individually, the same set of questions (34) and also most importantly to observe each one of them (34)	Stephanie Tex: 6yrs Teach: NIL
35	30%	NIL	20%	80% of children with sufficient knowledge will learn more. 20% of children with insufficient knowledge will gain new knowledge and better understanding of the new topic. They get to learn and discuss the new topic with friends and teacher (35).	We need to ask them simple questions on the topic (35)	Anonymous Tex: NIL Teach: NIL
36	90%	I hope that all children can gain the knowledge (36).	50%	I hope that the 50% of the children can gain the knowledge if they do not have the chance to learn about it (36)	When they do not know how to answer my question or anything about the topic they have no idea or prior knowledge or do not know what I am talking about regarding the theme, topic, concept	Peng Mui Pheng Tex: NIL Teach:NIL
37	90-100%	It is important that they have some background knowledge or are familiar with the topic. If children have prior knowledge, it is easier & would be useful to introduce new ideas/topics to student else efforts to do so will be wasted and perhaps you need more sessions for re-training (37)	80%	Those who have prior knowledge would be able to understand the subject and the 20% (who do not have prior knowledge) can be taught and knowledge extended to them on a one-to-one basis at a later time.(37)	-when students ask questions (37) -when you notice that they seem 'lost' or need help in the area - when they are unsure of the topic/subject taught (37)	Kim Meng Fuan (Female) Tex: NIL Teach:NIL
38	20%	I think that if children have insufficient prior knowledge it would be difficult to proceed with the lessons (38).	60%	In a real classroom situation <u>*time*</u> is constraint so it will better if the children have prior knowledge.(38)	By asking open ended questions to test their prior knowledge (38)	Sharfunnisa d/o A.Ap. Abdul Salam Tex: NIL

39	80%	I would want the children to have knowledge of what they know and do not know (39). I would teach children more topic/theme/concept of insufficient prior knowledge to expand even further (39)	80%	It is ideal to teach something the child has no knowledge(39) and as a teacher duty to expose children to have that level of understanding (39)	Through asking question, listening to chn answer (39) through drawing (39) or say other kinds of lesson and circle time (39).	Victoria Vimala Tex: NIL Teach:NIL
40	50%	It's easy to teach and achieve objective (40)	80%	Introduce new concept to all (40)	Observation (40), evaluation and projected result and actual result	K. Radha Tex: NIL Teach:NIL
41	0%	Children can always share their knowledge during the lesson. Those who know very well can always share. They might also add more knowledge to what they have learn/better understanding (41).	0%	Children can build better understanding in the new topic whether they have sufficient/insufficient.(41)	Through sharing sessions or accidentally(41)	Norlia Tex: NIL Teach: NIL

WHEN SHOULD TEACHERS TEACH NEW MATERIAL?
QUESTIONNIARE SURVEY RESPONSE
34 PRESERVICE RESPONDENTS: AF10 (28 Nov 2011)

No	*HYPOTHETICALLY* in an ideal situation, I would teach a new topic/theme/concept if ___% of the children had Insufficient Knowledge.		*In PRACTICE* in a real classroom situation, I would teach a new topic/theme/concept if __% of the children had Insufficient Knowledge		How do you find out students' insufficient knowledge	Teaching Exp
	Q1	Reasons Given:	Q2	Reasons Given:	Reasons Given:	
1.	100%	I believe this is how children learn children have the ability to learn and pick up new things fast. (1) Hence even if 100% of the students have no insufficient prior knowledge as a teacher we still can introduce the new topic to them.(1)	100 %	Again same reply as in my ideal situation. I don't think this issue of children having insufficient prior knowledge is a problem. Even if it is insufficient to achieve the learning objectives. What is important is the process of learning.(1)	Firstly, if the children ask alot of questions on that topic, this could mean they do not know or understand. (1) However if they keep quiet, they may not understand too. Hence, we may need to question them to understand their level of understanding (1)	TEx: 10 mths Stn: 3 yrs Sim Su Yen
2	20%	Different children learn at different pace. If most of the children have sufficient prior knowledge already, I guess I will start teaching.(2) For the minority I will spend a bit more time and attention on them (2).	80%	The curriculum is very tight. I cannot afford to wait for all the children to have sufficient knowledge before conducting lesson, I might just teach them along the way and see how it goes.(2)	When children are unable to answer questions post by the teachers.(2)	TEx:1 Stn: 4-5 Wu Xueli
3	20%	20% is a minority and thus I would try to teach the students through demonstration or when they are using the material I will guide them along instead.(3)	40%	There is a tight schedule and there is insufficient time to wait for all children to gain the knowledge(3)	Through questioning them (2)	TEx: 1yr Stn: 4-5yrs Jessie Lye
4	95%	As long as there are a few children who have insufficient prior knowledge these children might get lost during the lesson. I will ask questions to the 95% so that % will stay focused in the lesson at the same time, peer teaching/learning is shown.(4)	90%	It is important for all children to have prior knowledge about the topic before they are able to concentrate and have fun learning (4).	When the children do not know how to answer the questions.(4) When the children start asking more to discover more for themselves (4)	TEx: 7 mth Stn: 4- 5 Sarah
5	10%	The children can be exposed to a new topic. It creates opportunity for the children to learn (5)	50%	It will be difficult if there are too many children who do not have sufficient prior knowledge as it would mean taking up a considerable amount of time to obtain the objective of the delivered lesson(5)	The students might have responded their views or the children might be confused or clueless about what the teacher is trying to convey, showing no interest might be one of the reason as well (5)	TEx:8mths Stn: 3-4 yrs Lee Ming Xi

6	30%	I think that I would like majority of the children to enjoy what they are learning from their previous experience and knowledge.(6)	50%	I believe that not all children are exposed to the same things learning new knowledge without prior knowledge can be interesting(6)	Through the discussions where they share their experiences(6)	TEx:NIL Stn: 2-3 yrs Grace Wong
7	90%	Children need to acquire new concept in order to progress in their life (7)	50%	Children need to be exposed to new skills for them to use in later stage of their lives.(7)	If I introduced a new theme or concept, children are not aware and unsure how to do it.(7)	TEx: NIL Stn:6yrs Noraisah Binte
8	20%	I believe that most of the children should already be exposed to some of the topic/theme/concept by their environment.(8)	10%	Children might already have prior knowledge taught by their parents or from other sources(8)	I would gauge by the students' response to find out if they have insufficient knowledge. I will ask more questions to help me determine further. (8)	TEx:1 yr Stn:4 yrs Nurafiqah Hanoum Simatupang
9	20%	I believe children learn from their peers especially for older age group they are willing to assist their friend learning (9). In addition, to that I will provide more support for the children	10%	Due to the constraint that teachers faced as well as teacher's need in meeting the needs of the majority of students (9)	By asking questions to test their understanding (9)	TEx: 14 mths Stn: 4-5yrs Num Huda Rahmat
10	20%	Is still considered as a small group. The other 80% of the children can help those who couldn't cope. Moreover, I will give extra guidance to them too. (10)	10%	At least this range is still acceptable. Children can help one another and the teacher could also focus on them 5-10% better. If the children need extra guidance the teacher is able to give it to them (10)	Through their look(10), questions. In order to know if a child had sufficient knowledge of the topic or so the best way is asking them questions on what they know, in addition, the teacher can also ask them some descriptive questions. (10)	TEx: NIL Stn: NIL Chia Kai Chen Linda
11	90%	Almost all the children don't acquire yet the knowledge that they need to achieve their learning.	10%	Children still need to learn the topic even though almost all the children know the topic (11)	Through assessment, this will help me to identify the strengths and weaknesses of the students(11)	TEx: 1yr Stn:18-30mths Sheryl Garcia
12	0%	If the children do not have the prior knowledge, I will not be able to achieve the objectives of the lesson. But children nowadays are quite exposed to a lot of things (12)	100 %	If the children do not have the prior knowledge, teachers will still have to teach, no excuse given. The most teacher spend longer time for lesson and spend more effort.(12)	They will look at the teacher blankly and will not be able to answer very basic questions pertaining to the topic/theme/concept (12)	TEx: 7mths Stn: 5 yrs Loo Hwee Huan (Evonne)
13	50%	I feel that if at least half of the class knows the topic they can inform or teach one another(13)	0%	As a teacher we need to conduct our lesson and follow the curriculum. Teacher can spend more time to teach the children to help them understand (13)	The children have no answers to the questions or object post by the teacher. The children find it hard to understand the concept or unable to do the tasks (13)	TEx:11 yrs Stn: 4 yrs Syarafidah Razali
14	10%	I would ensure all children are familiar with the new concept/theme/topic to enable learning across. Reinforcing to the 90%	10%	I believe in giving children equal opportunity and as an educator, children's learning is my priority. Getting them to truly understand	I would ask questions on the new concept, ask children (those who know) to do a demo. For those who do not know, I would	TEx:1 yrs Stn: 2-3 yrs Prem Andina

		would be good for teacher to observe how much they know and the areas we can help them to improve (14)		beats than just fulfilling the lesson.(14)	also ask them to demo upon explaining to see how much they understand the concept. From there, I can select the areas to focus on. (14)	
15	80%	The lesson is only successful when the objective of the lesson is met (15). It is also good to let children brainstorm and contribute ideas as a group for peer teaching and learning. Hence, it is vital for children to have the prior knowledge of the theme(15)	0%	I believe that it is always good to expose children to new topic so as to increase their curiosity level and promote them to explore (15)	Through asking them questions regarding the topic/theme (15)	TEx: 1yr Stn: 4 yrs Liauw Li Ting
16	40%	Even if the majority already knew the topic, they can take it as a refresher of their knowledge (16)	10%	I believe that no child is to be left behind in terms of attaining new knowledge (16)	Through asking them questions before start of the class. By asking them to demonstrate on how to do things it will reflect clearly on whether students have insufficient knowledge.(16)	TEx:1yr Stn: 6-7 yrs Nur Hasyimah Binti Abdul Hadi
17	10 %	It would be convenient to teach the class as a whole on a new topic (17)	10%	It is more important that the 10% of the children receive the knowledge even before I extend the topic to be more complex(17)	I would check on the class past lesson plans from the previous teacher. I would question them on the topic. If they're capable of answering the question, I would assume that they've prior knowledge(17)	TEx: 1yr Stn: NIL Noraisah Binte Mohamed Noor
18	50%	Even though half of the class do not have any prior knowledge, they can learn through my assistance and mentoring (18).	50%	Children at this age are keen to learn and try out new things, therefore they would be able to grasp what I'm teaching especially with my assistance and also by watching their peers who already have prior knowledge.(18)	I can ask whether they have heard about the topic before or throughout my lesson. I could also notice through their understanding and how fast they grasp the concept(18)	TEx:9mths Stn: 2-3 yrs Siti Aisyah Omar
19	60%	I feel that even if there is a large number that do not have the prior knowledge, I am able to tune my lesson accordingly to instil knowledge for those who don't have prior knowledge and to challenge those that already have. However, the no. of chn who have prior knowledge should still be more so as for them to help the others during lesson.	60%	Of the same reason as above. Children can be split into groups and the lesson can still carry on with a slight change in objective for each group (19)	During tune in activities, questions will be asked to find out how much they have learnt, recall and remember from previous lesson (19)	TEx: 7mth Stn: 5 – 6 yrs Brenda
20	10%	Children might have low self esteem if they find other peers capable of carrying out the task when they are not. They may withdraw	30%	Teachers might not see the extra effort or time to teach a new concept as productive just to teach one or two children (20)	Refuse to participate When they are not able to carry out task in the proper steps (20)	TEx: 1 yr Stn: 5-6yr Jasmine

		participation in sports in future				
21	40%	Children may not know what they don't know. If 6 out of 10 knows. 4 out of 10 students could also be able to grasp concept fast enough to keep up (21)	50%	Direct feedback can be received from students who think they know a new concept. If feedback indicates children's uncertainty there is a definite reason to teach the new concept to whole class.(21)	Gather feedback from open-ended question. Ask what do they know then offer explanations/thoughts (21)	TEx: 1yrs Stn: 5-6 yrs Amber
22	50%	As long as half the number of children have insufficient prior knowledge it would be pointless to go ahead (22).	60%	Compared to hypothetically, in real practice we don't have sufficient resources and time to teach a new topic/theme/concept if only a small percentage of children have insufficient prior knowledge(22)	Have discussions,(22) questions and answer (22)	TEx: 1yr Stn: 5-6 yrs Melissa Lim
23	30%	Although almost half the class doesn't have enough prior knowledge it would not be that difficult as the rest would be willing to help their classmates out.(23)	10%	The topic might have to be taught anyway, or maybe the students are interested in them(23)	Through conversations (23); questions. (23)	TEx: 0 Stn: 5-6 yrs Marissa Law
24	40%	If 4 out of 10 do not have sufficient knowledge it will hinder the progress of lesson as a whole. There would also be lack of positive constructive discussions during lesson time.(24) If the percentage is lower it's still possible for personal coaching by teacher or even learning from peers.(24)	NIL	In my centre we are given lesson plans to follow. School will set the themes/lesson to be taught as deem appropriate by supervisors (24)	- When they have a blank look when questions are asked (24) - When they have difficulty meeting the objectives of lesson (24) - When they give inappropriate/irrelevant contribution during discussion(24)	TEx: NIL Stn: 2-6 yrs Jenny Heng
25	20%	1. There are children who are special or not interested to learn.(25) 2. I have to follow the pre-planned curriculum or else I have to be answerable to my supervisor (25) 3. I must also think or consider the majority 80% and can later help the 20% during free period(25)	20%	1. There are children who are special or not interested to learn.(25) 2. I have to follow the pre-planned curriculum or else I have to be answerable to my supervisor (25) 3. I must also think or consider the majority 80% and can later help the 20% during free period (25)	By asking open-ended questions to the children and note down who is answering and what they are expressing. I will also ask some of the quiet children about their thoughts to see how much they know before I start (25)	TEx: 7mths Stn:6-7 yrs Sumana
26	0%	Learning is a group experience, and no child should feel lost (26)	100 %	At my pre-school we have a syllabus to complete. My host teacher gives me work which I have to do. Irrespective of whether the children have learnt anything or not, documentation has to be produced. It's more of a show really.(26)	I know my children quite well, as far as their capabilities go. However since children are ever changing in their needs and interests a personal conference would help draw out their knowledge on a particular topic (26)	TEx:1 yr Stn:5-6 yrs Dcosta Brenda Sheila

27	30%	All children should be taught a new topic/theme concept equally (27)	20%	When all of the children have sufficient knowledge, it will be useful and fair for them (27).	When the child is uncertain/lost when being asked to do what they were told (27)	TEx: 1yr STn: 2-6 yrs Fadilah
28	20%	I believe that all children should be clear about what they've need to know in order to participate in the activity. If they need sufficient prior knowledge they would need to be educated about it.(28)	30%	Same reason as above and that there may be insufficient time to go through concepts that may be time consuming(28)	I ask them related questions to my topic (28)	TEx: 2 yr Stn:5 yrs Sufri
29	20%	When I start the new topic, I would want all my children to understand what are the requirements and to standardise and set the rules from the beginning (29)	50%	In real classroom situation there are different set of rules. Of course I will still teach, but will then pull out the group who don't have sufficient knowledge and execute the lesson.(29)	I will ask them questions for example, who understand and who don't understand in their term.(29)	TEx:1yr Stn:6 yrs
30	80%	Children love to explore new things. Teaching them things they already knew will bore the children. They will then lose interest in the activity and thus will result misbehaviour conduct. They will hardly listen and play their own style.(30)	50%	When half of the children do not know the topic/theme, the other half could help out. This result in more engaging lesion although they will take a longer time to learn.(30)	If they keep asking the teacher how to do this/how to do that. Children will get irritated if teacher could not make them understand.(30)	TEx: 13 mths Stn:18-30mths Syarina
31	5%	It would be counter-productive to teach a new concept if most of my children do not have adequate prior knowledge.(31)	20%	We have to follow the lesson plans and curriculum set by the Centre (31)	Through inquiries (31) and observation.(31)	TEx: <1 yr Stn:2-3 yrs Siti Mariam
32	50 %	If half of the class know or have prior knowledge of the concept, I would be able to focus on those who don't know.(32)	10%	I could gradually teach them about the new concept & involved the whole class.(32)	First I would let them explore with the apparatus first. Thus, after getting their feedback or reaction, I would tell if they have insufficient knowledge of the topic/theme/concept.(32)	TEx:1 yr Stn: NIL Noor Sureya Sahir
33	100%	Even though children have no prior knowledge or a certain concept or theme, teachers still have to educate them on the concept it has to start somewhere.(33)	100 %	Of the same reason I had for hypothetical: Even though children have no prior knowledge or a certain concept or theme, teachers still have to educate them on the concept it has to start somewhere.(33)	Through observations (33) and assessments(33)	TEx: <12 mths Stn: 3-7 yrs Feequah
34	70%	Concept is important (34)	80%	Time restraint, practicality, different progression.(34)	Individual coaching(34), observations (34) , obstacle courses.	TEx: 12 mths Stn: 3-6 yrs

Teachers & Children's Perspectives 6 July 2012

5 Teachers' Perspectives		
Children Factor	**Teacher Factor**	**Environment Factor**
Why sometimes children do not learn anything new after a lesson?		
Teacher Chiu Ping		
• Day dream • Tired, not attentive (lack of sleep, on medication) • Socialize with peers • Slow learner • Get distracted easily	• Not having enough props or real objects • Information was not clearly delivered • Not allowing children to engage in Q & A, songs or game during lesson (hands-on) • Lesson was long and boring.	• Noise from other classes • Class size too big
Deng Lao Shi		
• Lack concentration, not attentive, playing • individual child is limited in strength or intellectually limited, don't understand • not interested, already had learned or grasped the material taught • language barrier • unwilling to learn or don't understand • does not like the things that the teacher teaches	• Unable to deliver the main point to allow the children to understand the issue or main points. • The teaching content is detached from the children's life experience • May not be age appropriate to the children's development	
Joanne		
• Cannot concentrate • The children are not interested in that topic • Too busy talking during lesson time • Children already know what to do	• Lesson too long/boring • Lack of activity • The lesson is hard/easy to understand	
Cindy		
• Children cannot understand the meaning/concept during the lesson • Children did not pay attention during the lesson • Children not interested in the topic during the lesson		
Chen Lao Shi		
• The children lacked interest in learning • The children are mischevious, playfulness affect the lesson and the teaching process.	• It concerns the teaching methods • Whether the material taught could attract the children • The lesson's content or the level pitched was it appropriate?	• Was the environmental set up helpful to the lesson?

16 K2 Children

Why, children CAN understand a lesson? 6 July 2012

8 Children: Wei Le, Boon You, Xin Ran, Joe, Aden, Louis, Zhong Ming Feng, Kai Ser

Teacher Factor

- Kai Ser: The language that the teacher speaks
- Boon Yu: Teacher help we all to learn everything; to test you to grow up
- Kai Ser: Becos teacher also have test after/during lesson

Children Factor

- Ming Feng: Becos we pay attention
- Ming Feng: Children very grown up becos we understand, every time at home I read books
- Aden: You must keep study, and study so you know how to read the word. Must learn a lot of things.
- Boon Yu: To know everything; study hard you know
- Wei Le: Becos we learn
- Ming Feng: Study hard next time you grow up you can learn a lot of things
- Aden: Study hard and hard next time you will be rich
- Xin Ran: Becos when teacher teach you know how to learn and do homework
- Ming Feng: I understand always becos I read
- Boon Yu: Becos we all know how to do work; listen to teacher
- Aden: If you study hard you get better; teacher asks you this question you know how to write.
- Joe: Becos I listen to teacher
- Aden: And Joe do work very fast becos he listens and never talk at all and sit properly do work very fast.

Why, sometimes children DO NOT understand a lesson? 6 July 2012

8 Children: Wei Le, Boon You, Xin Ran, Joe, Aden, Louis, Zhong Ming Feng, Kai Ser

Children Factor

- Boon Yu: Didn't listen; keep naughty and didn't pay attention
- *Kai Ser:* Father, mother didn't teach you before and we never listen
- Ming Feng: Becos never concentrate and teacher asks you don't know
- Loui: Becos we never learn that new word before
- Aden: If you never concentrate what teacher say; when you do work see people work; is wrong already.
- Ming Feng: Becos don't pay attention, like Zuriel very blur like that.
- Joe: Becos sometimes they never concentrate and listen to teacher becos keep playing.
- Boon Yue: He didn't listen; didn't read books everyday.
- Louis: They only care about playing and do not try to listen.
- *Aden:* Like Rade think of playing never study, teacher scolds until he study. If father/mother never teach you anything, you only think of playing; you never learn anything when teacher

ask you, you don't know what teacher talking about. If like every time you playing and play teacher ask you to study; father/mother ask you; you don't know if you keep playing you don't learn anything

- Boon Yu: Becos you didn't listen to teacher you keep copying people's work teacher will scold you.

Why copy other's work?

Louis: Becos they don't understand; never pay attention and bothering others

Why, sometimes children DO NOT understand a teacher's lesson?

8 K2 Children: Ian, Stacy, Ellynna, Jeremy, Rave Lim, Zuriel, Ong Jun Kai, Jia Xin

Children Factor

- Jeremy: I didn't listen to teacher; keep playing
- Jia Xin: Didn't pay attention
- Ian: Children like playing
- Stacy: Didn't pay attention; playing with children
- Rave: I play with JiaXin
- Jeremy: Becos keep playing during lesson time
- Ellynna: Keep playing
- Zuriel: Becos i don't know; becos I blur, blur
- Ellynna: Becos anyhow do work/paper; flip pages
- Stacy: Becos keep playing; flip many pages & didn't pay attention becos so many things you don't know then you flip many pages then teacher give you one page.
- Ian: Sometimes want to play
- Jia Xin: Becos the word I don't understand I ask the teacher, I still don't understand what teacher say, becos some words I understand, somewords I don't becos my mother/teacher haven't teach some words
- Jun Kai: Biting my hand
- Rave: Keep playing, never pay attention; do work you don't know
- Jeremy: Sometimes teacher will scold you becos you very naughty

Why, children CAN understand a lesson?
K2 Children: Ian, Stacy, Ellynna, Jeremy, Rave Lim, Zuriel, Ong Jun Kai, Jia Xin

Children Factor /Teacher factor

- Stacy: becos sometimes you know everything you can read the story book. Teacher ask a question; teacher say çorrect'
- Ellynnna: You must pay attention get all the words correct you get 3 stars. Becos teacher say you very good. Pay attention- must listen teacher then teacher read story
- Jia Xin: becos a lot of interesting thing that teacher teach e.g. food pyramid
- Jun Kai: Becos I pay attention

18 KI Children
Why, children CAN understand a lesson? 6 July 2012 5 KI Children: Zavier Ho, Hannah Ho, Peng Hong, Foo Khia Ying, Soh Pei Xuan
Children Factor
• Khia Ying: Becos Teacher will ask you one when we don't know • Pei Xuan|: Becos I hear • Zavier Ho: You naughty the teacher will scold you • Peng Hong: Becos you shout everybody keeps quiet
Why, sometimes children DO NOT understand a lesson? 6 July 2012 KI Children: Zavier Ho, Hannah Ho, Peng Hong, Foo Khia Ying, Soh Pei Xuan
• Khia Ying: Becos teacher never ask/tell we all; Never hear teacher says what • Pei Xuan: Becos last year in N1/ N2 • Zavier Ho: Talk already teacher lesson you don't know; fight with friends • Hannah Ho: Becos we all play toys cannot fight people and cannot snatch • Peng Hong: Becos teacher go toilet cannot find teacher
Why, children CAN understand a lesson? 6 July 2012 5 Children: Ng Kai Ning, Clarice Woo, Low Yit Hong, Lim Jia Qian, Chen Xiang
• Clarice Woo: Becos Teacher Chiu Peng teach we all. • Jia Qian: Becos Teacher Chiu Peng got teach us • Kai Ning: Becos Teacher Chiu Peng speak English • Clarice Woo: We all also speak English • Yit Hong: Becos give toys to we all •
Why sometimes children DO NOT understand a lesson? 6 July 2012 Children: Ng Kai Ning, Clarice Woo, Low Yit Hong, Lim Jia Qian, Chen Xiang
• Jia Qian: Becos Teacher Chiu Peng never teach we all; becos don't teach anything that's why we don't know how to do • Kai Ning: Teacher Chiu Peng never write name for we all; never teach we all name • Clarice Woo: Becos teacher Chiu Peng don't like we all; Becos Teacher Chiu Peng spell the word • Cen Xiang: Becos Teacher Chiu Peng never teach we all and never write the date; any how do'then do worksheet not nice • Yit Hong: Becos never give we all to read story books • Chen Xiang: Becos teacher never write something to we all'; we all do worksheet don't know, we think, think, cannot think; teacher give you so easy worksheet don't know how to do.

Why children CAN understand a lesson? 6 July 2012 3 Children: Fabregas See, Alicia Wong, Chloe Qian
• Alicia: Teacher ask we all to play toys • Fabregas: Becos teacher speak a little bit loud we all can hear • Chloe: Teacher will ask children to do the homework
Why, sometimes children DO NOT understand a lesson? 6 July 2012 Children: Fabregas See, Alicia Wong, Chloe Qian
• Fabregas: Becos Teacher talk about hard things; so we don't know • Chloe: Becos when teacher say bathe, then bathe then when teacher give the toys meands children play the toys • Alicia: Becos teacher never teach us becos we never learn • Chloe: Becos we very naughty • Fabregas: Becos we never listen to teacher and teacher scolded • Alicia: Then we very sad
Why children CAN understand a lesson? 6 July 2012 5 Children: Jason Ang, Wilson, Lee Hui Ern, Lucas Pek, Reyes Chia
• Lucas: Teacher Chui Peng teach the song then I see (the teacher was teaching a rhyme to the children during interview time) • Jason: Becos Teacher Chiu Peng teach we all sing song • Wilson: Becos teach we all to write • Reyes: Becos teacher teach us when we are doing homework. Becos teacher teach us to do homework. • Hu Ern: Becos teacher teach we all drawing.
Why sometimes children DO NOT understand a lesson? 6 July 2012 Children: Jason Ang, Wilson, Lee Hui Ern, Lucas Pek, Reyes Chia
• Lucas: Sometimes I don't understand the drawing – I don't know • Jason: Becos Lucas & Zaview play dong dong chian 'lion dance' • Wilson: Becos Lucas keep talking to me • Hui Ern: Becos drawing not understand • Reyes: Becos so many people want to talk to me

Kindergarten Children's Perspective 20 July 2012
Total 27 KII children (12 Girls, 15 Boys)

K2 Children
Why, sometimes we DON'T understand a lesson? 11 July 2012 **5 Children: Chloe (DOB 7/9/2006), Por Kateyi (9/5/2006) , Tyrone Lee Jagtar (17/5/2006), Jerald Cheng (8/3/2006), Josh Kong (24/9/2006)**
Josh: Becos is too hard Chloe: Becos too hard becos some words we don't know. Becos very hard to answer. Friends play then we cannot then ask them to"Sh!!!" then teacher scold them a lot of noise until we cannot hear. Kateyi: Becos is hard to explain. Sometimes very, very, very, very hard to explain. Jerald: Becos I know that people not paying attention Josh: Sometimes I learn new things and old things then teacher asks us to see and do work
Why, sometimes we CAN understand a lesson? 11 July 2012 **5 Children: Chloe, Kateyi, Tyrone, Jerald, Josh**
Tyrone: I understand bcos Mrs. Leong teach me. I learning – good. Jerald: I know!!!! I know all – becos I'm English person
Why, sometimes we CAN understand a lesson? 11 July 2012 **4 Children: Jynnette Tan (DOB 6/10/2006), Ethan John Cleaver (22/01/2006), Glen Poon (17/10/2006), Sean Ethan Cheo (17/7/2006)**
Jynette: Becos we listen Ethan: Becos some is simple, some is not simple, some we can't understand Glen: Sometimes very simple becos I understand mah.. sometimes like spelling Sean: Becos I always keep quiet & listen
Why, sometimes we DON'T understand a lesson? 11 July 2012 **4 Children: Jynnette, Ethan Cleeaver, Glen Poon, Sean Ethan**
Jynette: Becos we talking Ethan: Becos I talk a little bit I can't hear my teacher talk Glen: Becos sometimes all my friends keep talking to me then later I forget already – noisy. Sean: Becos I always looking at Ethan and always talk Jynette: Sometimes I cannot understand becos Chloir is screaming and talking too loud. Becos the instruction are too hard. Sometimes, my mother gets primary one book to practice for primary one.
Prior Knowledge Factor
Ethan: Simple – becos we learn it at home. Mother & father teach me.

Why, sometimes you CAN understand a lesson? 12 July 2012 **7 Children: Ian Kwok (DOB 11/2/2006), Chloe Kan (13/7/2006), Brandon Lee (20/01/2006), Spencer Lavern Tupac (23/3/2006), Ang Xiu Er (7/11/2006) , Sallie Toh (18/8/2006), Elizabeth Au (18/7/2006)**
Teacher Factor - Language
Ian: Becos is English; teacher will tell us the work to do Xiu Er: Becos is simple English Brandon: Becos is simple English Chloe: Is English
Why, sometimes we DON'T understand a lesson? 12 July 2012 **7 Children: Ian, Chloe, Brandon, Spencer, Xiu Er, Sallie, Elizabeth**
Teacher Factor
Ian: becos is hard like teacher speak Chinese; the work is a bit hard; what's some words – becos the word is hard to understand Xiu Er: Becos is not simple Chinese/English – becos I'm Korean Brandon: Becos' is hard/becos the puzzle is hard Brandon: Becos sometimes teacher wants you to follow you don't know how to follow – don't know how to help.
Children Factor
Chloe: Becos sometimes I don't know what the words are Ian: Worksheet is hard Brandon: Becos' sometimes we don't know how to draw XiuEr: Becos sometimes we never know how to write Ian: also never pay attention so you don't know how to do Elizabeth: Becos we are absent Brandon: Sometimes we don't know how to colour Ian: Sometimes we don't know how to trace Chloe: Sometimes I scribble Elizabeth: Sometimes we make mistakes Brandon: Sometimes we don't know how to talk, is shy Ian: Sometimes we don't know how to speak the word. Don't know how to answer the question XiuEr: When we are naughty, don't pay attention; sometimes you don't know what teacher writing

Ian: Don't know how to read teacher's writing Spencer: I understand becos I learn ; Don't understand becos I don't know any language.
Prior Knowledge Factor
Brandon: Becos we learn. Becos we at home sometimes learn Ian: Sometimes at home you never learn spelling, so you don't know what to write Brandon: Teacher wants us to sing and dance, we don't know – at home never learn to practice
Why, sometimes we CAN understand a lesson? 20 July 2012 **4 Children: Josh Kong (DOB 24/9/2006), Kireran Tan (17/5/2006), Tricia Tan (27/4/2006), Austin Ho (15/10/2006)**
Austin: Don't listen we will not pay attention then scold. Josh: Becos English Tricia: Sometimes is easy. Becos sometimes like circle is very easy Austin: Becos you can draw a circle is round Tricia: Sometimes we can listen Josh Kong: Sometimes we don't listen Kireran: And we listen sometimes also; sometimes is easy and not easy Tricia: Sometimes we listen if we don't listen is difficult Kireran: Becos circle sometimes we just write
Why, sometimes we DON'T understand a lesson? 20 July 2012 **4 Children: Josh Kong, Kireran Tan, Tricia Tan, Austin Ho**
Kireran: We don't listen. We sometimes dig nose. Tricia: becos we never see how teacher teach us – becos we are talking Austin: Dont listen will be very angry; angry and let you punishment and go Ms Chen office Kireran: Other kids are talking, we never listen becos they are always talking Austin: Teacher is talking; we always talk go to Ms Chen office Kireran: Ask mummy to test spelling at home. Tricia: sometimes I learn spelling myself. I write many times myself Josh: Becos at home we don't learn. At home I learn maths & writing

Kireran: And exercising at home and play for a short while

Josh: Grandfather teach me at home

Kireran: My daddy & mummy teach me at home

Tricia: Mummy teach me at home

Austin: Mummy teach me piano and daddy teach spelling. So my JieJie teach me spelling & Chinese tin xie.

Why, sometimes we DON'T understand a lesson? 20 July 2012
7 Children: Gareth Quek (DOB 11/3/2006), Bryan Lee (20/1/2006), Gabrielle Ten (27/11/2006), Jaena Pang (15/8/2006), Tan Xin Yi (23/3/2006), Kirstin Kwok (24/3/2006), Kieran Nyeo (2/6/2006 – Boy)

Kieran Neo: Becos too difficult, becos we don't understand

Bryan Loo: Becos is too hard to understand they tell us we don't know and then cross, write again, cross
write again and then good and then play and no time to finish do something else and go home. The End.

Gareth: Becos is too complicate becos sometimes is like a house a HDB flat. Hard like making a HDB flat – we may don't understand becos we're lazy and want to play.

Kirstin: becos is a bit complicated and sometime we may not understand its meaning and name it in Chinese or English

XinYi: Sometimes we forget

Kirstin: too difficult

Gabrielle: Becos sometimes we do spelling we get wrong and is too difficult for us

Bryan Loo: If I'm at home I start to write

Why, sometimes we CAN understand a lesson? 20 July 2012
7 Children: Gareth Quek, Bryan Loo, Gabrielle, Jaena, Tan Xin Yi, Kirstin, Kieran Neo

Gareth: Becos we know English & Chinese

Bryan Loo: Numbers, matching, Chinese becos Su lao shi tell me to do that

Kieran Neo: Becos I know what they teach me; becos they explain to you and becos they tell me

Gareth Quek: Becos they teach me spelling/ tin xie becos they sound the sound out

Kirstin: Becos I usually know Chinese and English so when they talk, I know

Who teaches you at home?
Gareth: My Mummy Bryan Loo: Mummy Gabrielle: My mother Xin Yi: My father and mother Kirstin: Father for English & mother for Chinese Kieran: My mother teach me Maths/Chinese; my father asks me to read Chinese books every night

Theme: Wild Animals

Level: Kindergarten II (6 years old)

Lesson 1	**Topic: Name the wild animals**	**Date: 10 Nov 2010**

Lesson Objective:

1. Children will be able to name and spell a list of wild animals
- (lion; tiger; elephant; fox; wolf; rhinoceros; monkey; zebra; deer; giraffe; cheetah)

Material & resources

- Flashcards of names of animals and pictures of wild animals
- Book: My first book of animals (Apes, deer, zebra, giraffes, pythons, rhinoceros, crocodiles, porcupines, bald eagles, kangaroos up close, hippos in the wild, rainforest animals

Procedures

1. Sing the song "Leo the lion" with the children
2. Introduce the topic on wild animals and encourage children to name some of the wild animals that they know.
3. Read to them the book titled "My first book of animals"
4. After the reading session, conduct a question and answer session with the children. The one with the highest points win.
5. Then spilt the children into two groups and conduct an activity called the "Hang Man" game based on the theme "Wild animals."
6. In this game children will need to produce letters and towards the end when two letters remain, children are allow to name or guess the wild animals. The group with the highest points wins.
7. Reinforce with the children on the lesson that has been covered.
8. Lastly, children to proceed to do their seat to complete their work

Evaluation

Wild Animals Drawings by 14 children (5-6 years)

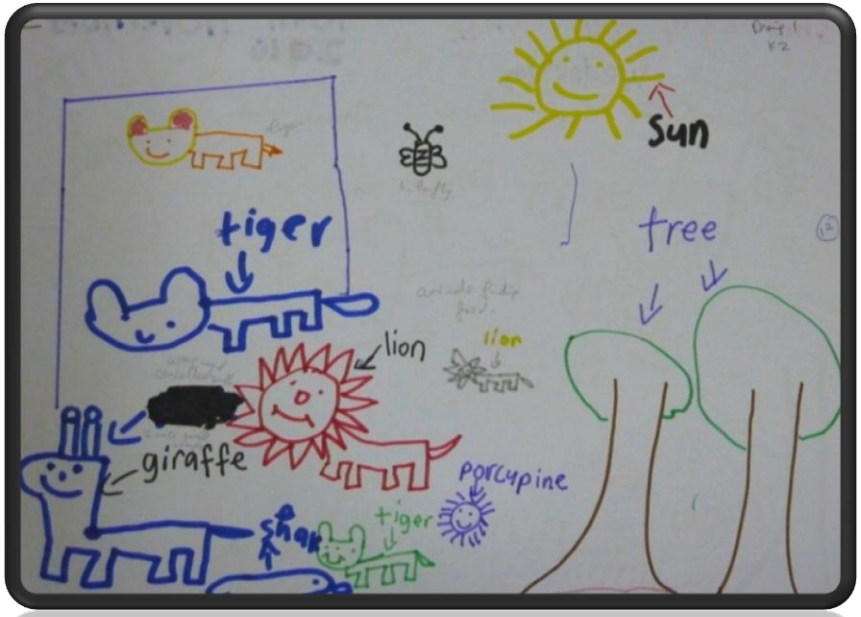
Chapter 5

Appendices E1 to E28

pp. 371 to 398

Child P11

Appendix E1 (pre) p.371

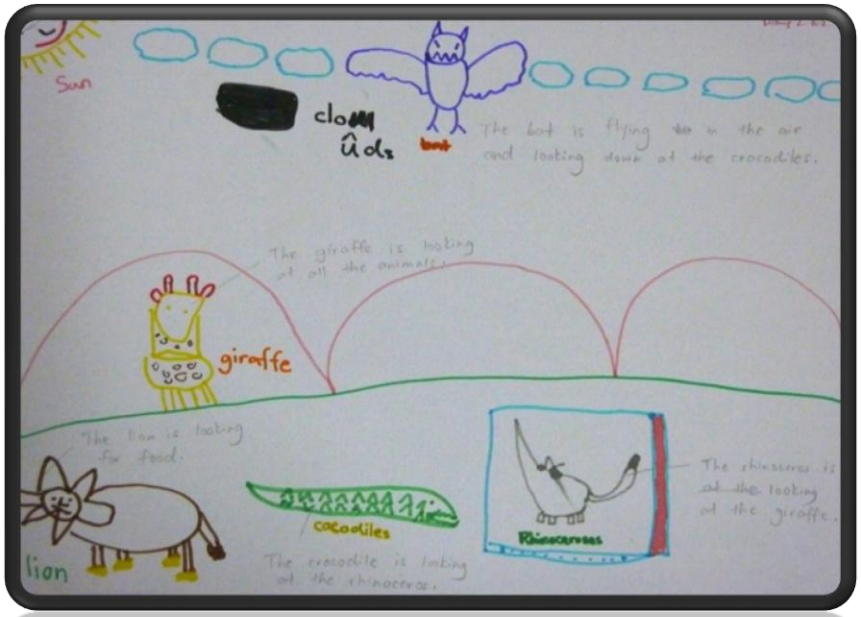


Appendix E2 (post) p. 372

Child P07

Appendix E3 (pre) p. 373

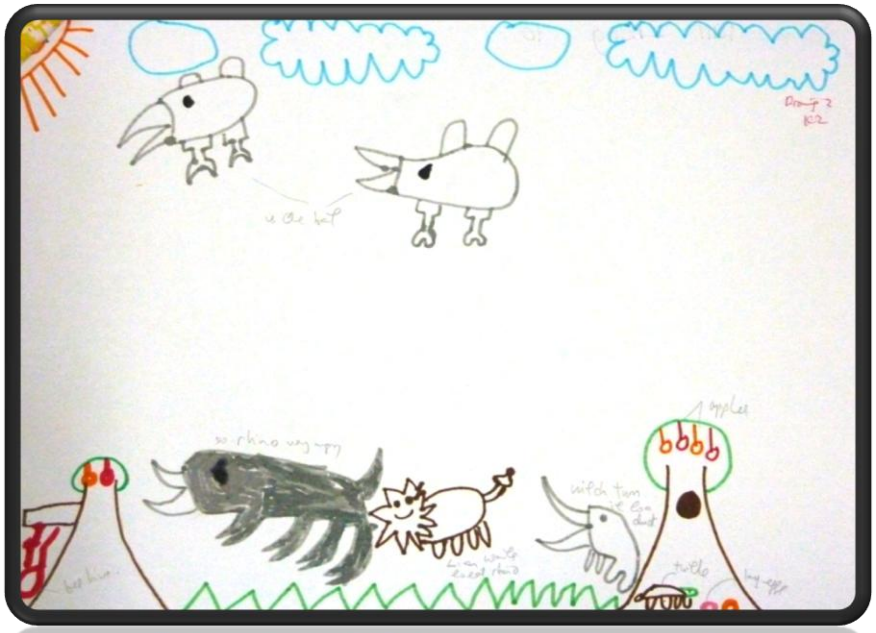
Appendix E4 (post) p.374



Child

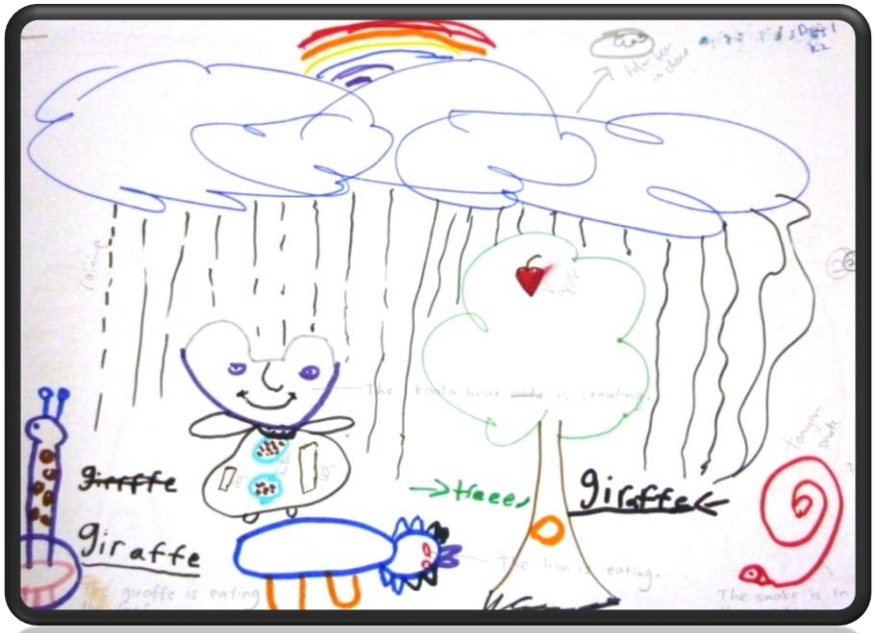
Appendix E5 (pre) p.375

Appendix E6 (post) p. 376



Child P02

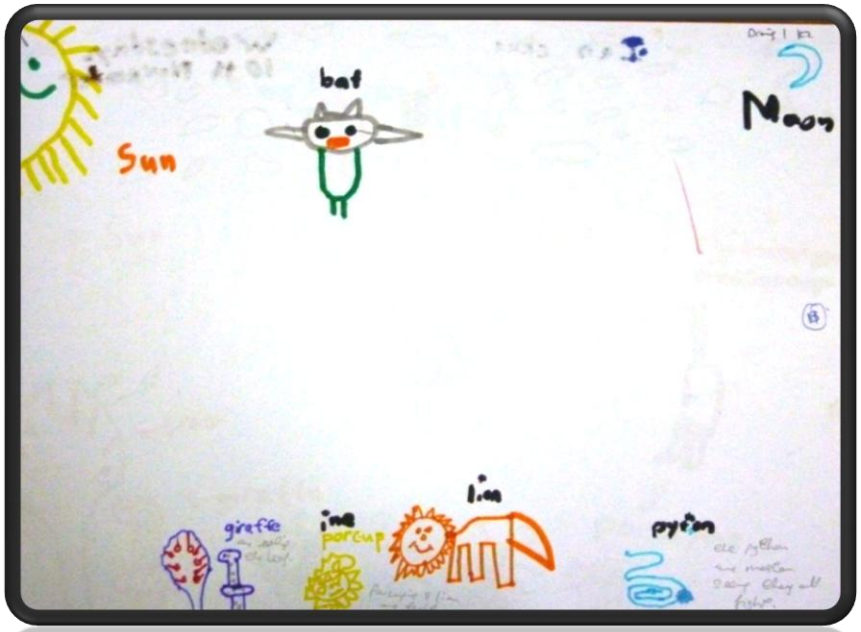
Appendix E9 (pre) p.379



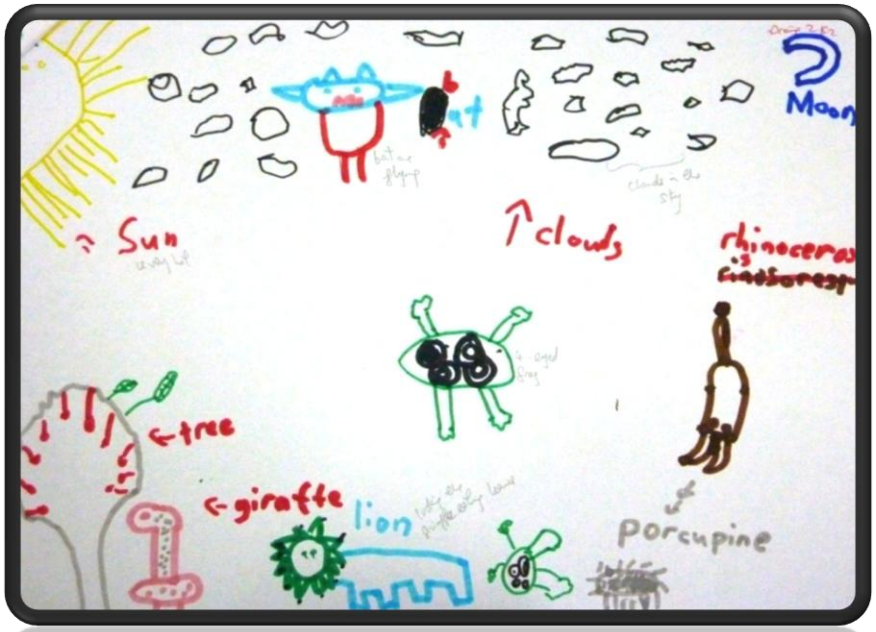
Appendix E10 (post) p. 380

Child P12

Appendix E11 (pre) p. 381



Appendix E12 (post) p.382



Child P04

Appendix E13 (pre) p.383

Appendix E14 (post) p.384

Child P10

Appendix E15 (pre) p. 385

Appendix E16 (post) p. 386

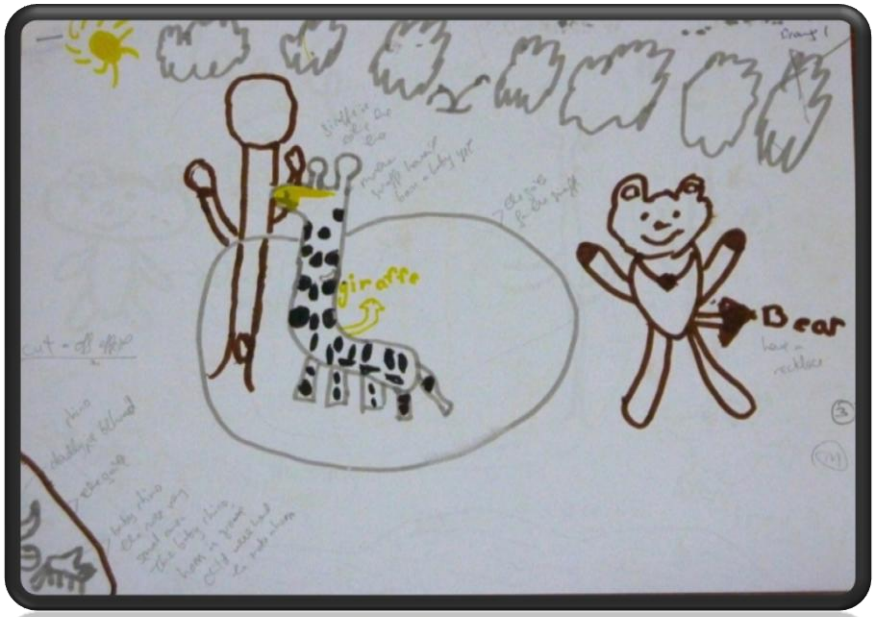
Child P14

Appendix E17 (pre) p. 387

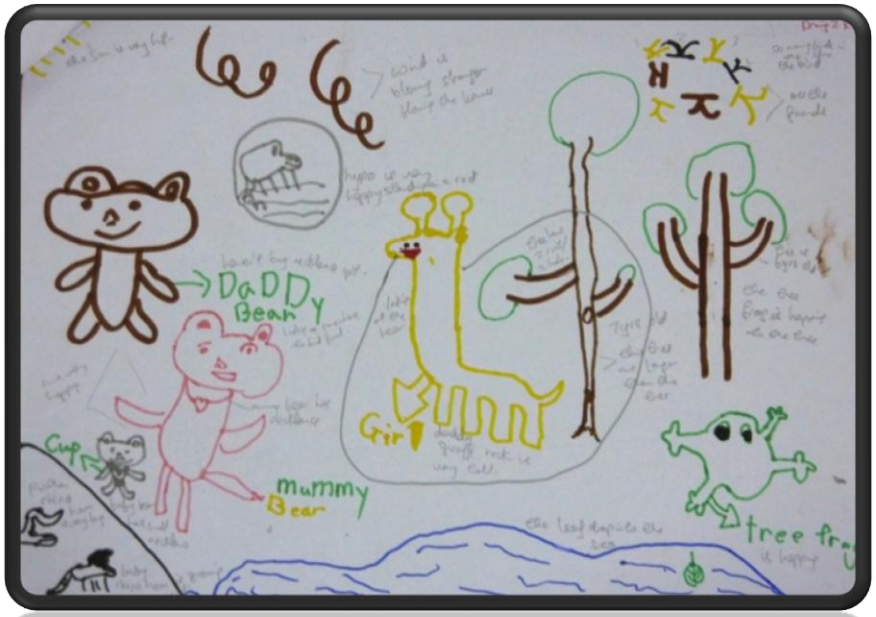
Appendix E18 (post) p. 388

Child P03

Appendix E19 (pre) p.389



Appendix E20 (post) p. 390



Child P05

Appendix E21 (pre) p.391

Appendix E22 (post) p. 392

Child P06

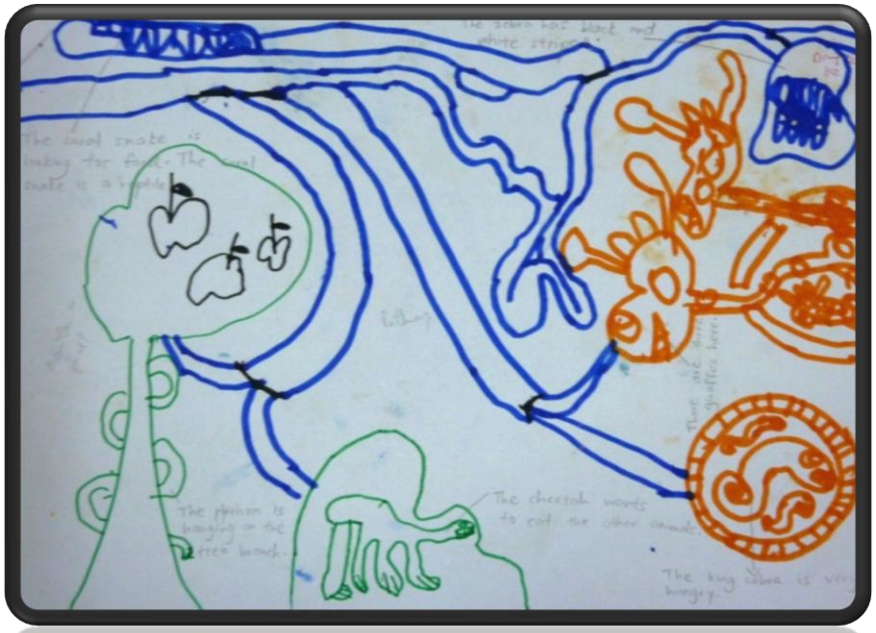
Appendix E23 (pre) p.393

Appendix E24 (post) p. 394

Child P08

Appendix E25 (pre) p. 395

Appendix E26 (post) p. 396



Child P09

Appendix E27 (pre) p.397

Appendix E28 (post) p.398

WILD ANIMALS Information Item Checklist 14 April 2012

Wild Animals Information		P01		P02		P03		P04		P05		P06		P07		P08		P09		P10		P11		P12		P13		P14	
Did the child draw & NAME		**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**
1	Lion		**1**	**1**	**1**																								
2	Tiger																												
3	Elephant																												
4	Fox																												
5	Wolf																												
6	Rhinoceros		**1**			**1**	**1**																						
7	Monkey				**1**																								
8	Zebra																												
9	Deer																												
10	Giraffe	1			1																								
11	Cheetah																												
12	Outdoor scene of trees, sun, grass	1	1	1	1	1	1	1																					
13	Zoo scene of cages																												
14	Wild animals' habitat																												
Did the child draw & SPELL																													
1	Lion	**1**						**1**																					
2	Tiger	**1**																											
3	Elephant																												
4	Fox																												
5	Wolf																												
6	Rhinoceros																												
7	Monkey																												
8	Zebra																												
9	Deer																												
10	Giraffe			**1**		**1**	**1**	**1**																					
11	Cheetah																												

| | | |

| | | |

2011 Kindergarten 2: Term 2

Week 2: Theme: Water – Water Cycle

Day: Wed,30/03/2011

Subject Area Thematic – Language Arts & Science

Objectives

Children will track evaporation of an open container of liquid over the week and compare against a closed container.

Children will be able to identify the various stages of the water cycle – evaporation, condensation, precipitation (rain), collection.

Procedures

Materials:
Hot & cold water, clear cups, food colouring, eye-droppers; Drippy the Raindrop story by Joel Kimball on powerpoint, laptop computer & projector, word cards with the words: evaporation, condensation, precipitation & collection; 4 slides of Drippy evaporating, condensing, precipitating and collecting.

Introduction:
Get children to check the water levels in the two containers and record them in their worksheets. Ask children what has happened to the water in the two containers that they have been tracking. Ask children if they think that the water in the container is moving. Let children observe & compare what happens when a drop of food colouring is dropped into hot water and cold water (use clear cups) – water is made up of molecules that move and these can escape into the air.

Main Body:
Tell children the story of Drippy the Raindrop using the powerpoint presentation and show the children the appropriate word card when it comes to that part of the story.

Closure:
Show children the slide of Drippy evaporating. Ask children what is happening when Drippy goes up into the sky? Show children the slide of Drippy condensing. Ask children what is happening when Drippy lands on the cloud? Show children the slide of Drippy precipitating. Ask children what is happening when Drippy falls with the rain? Show children the slide of Dripping collecting in the ocean. Ask children what is happening when Drippy joins the river and ocean?

Worksheet:
Thematic Workbook Page 4.

Follow-up activities:
Set up a water cycle in a bowl for children to observe what happens over a few days. (See procedures on next page.

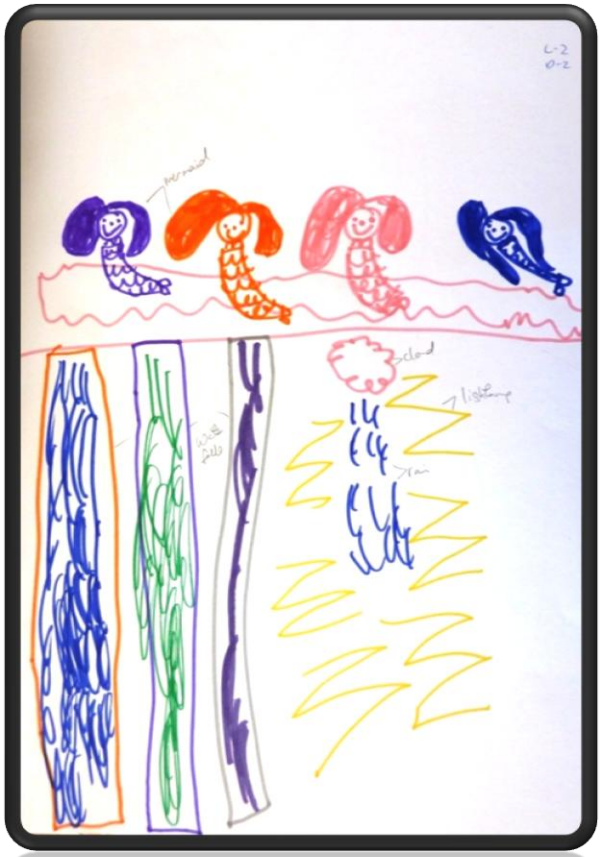
Evaluation:

Water Cycle Drawings by 11 Children (5 - 6years)

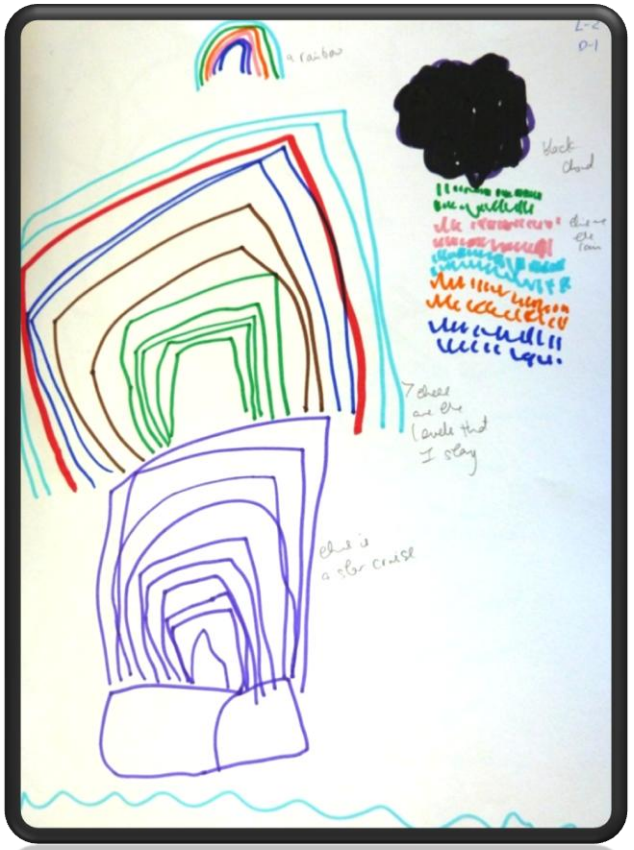
Appendices
F1 to F18 (pp.401- 418)
F19 Worksheet (p.419)
F20 & F23 (pp. 420 – 423)

Child TM01

Appendix F1 (pre) p.401

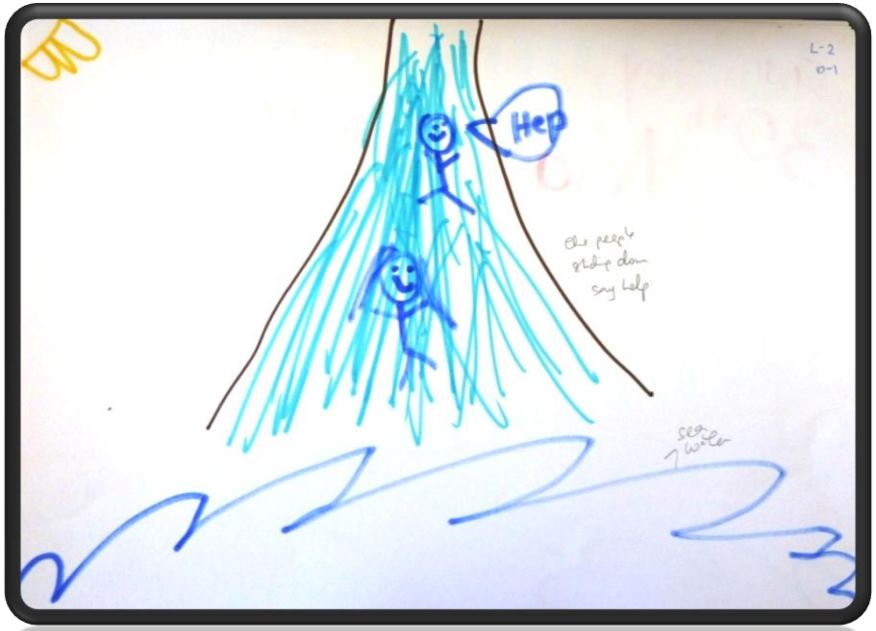


Appendix F2 (post) p.402



Child TM02

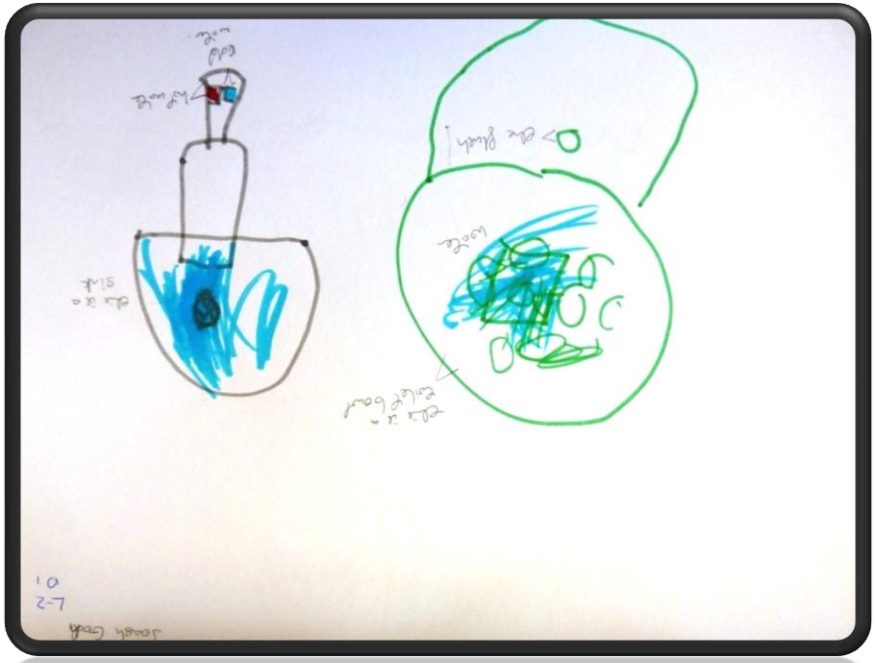
Appendix F3 (pre) p.403



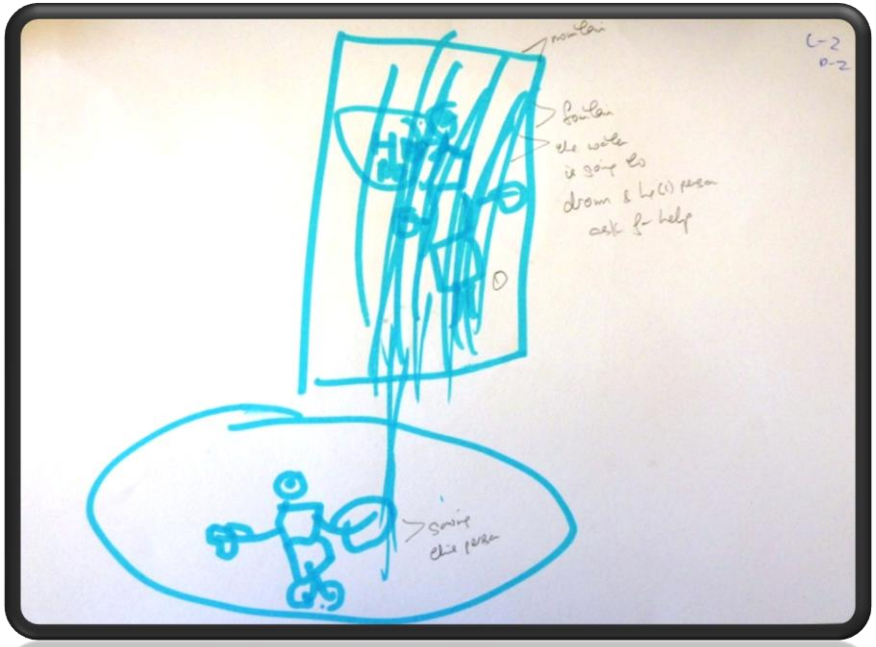
Appendix F4 (post) p.404

Child TM04

Appendix F5 (pre) p.405



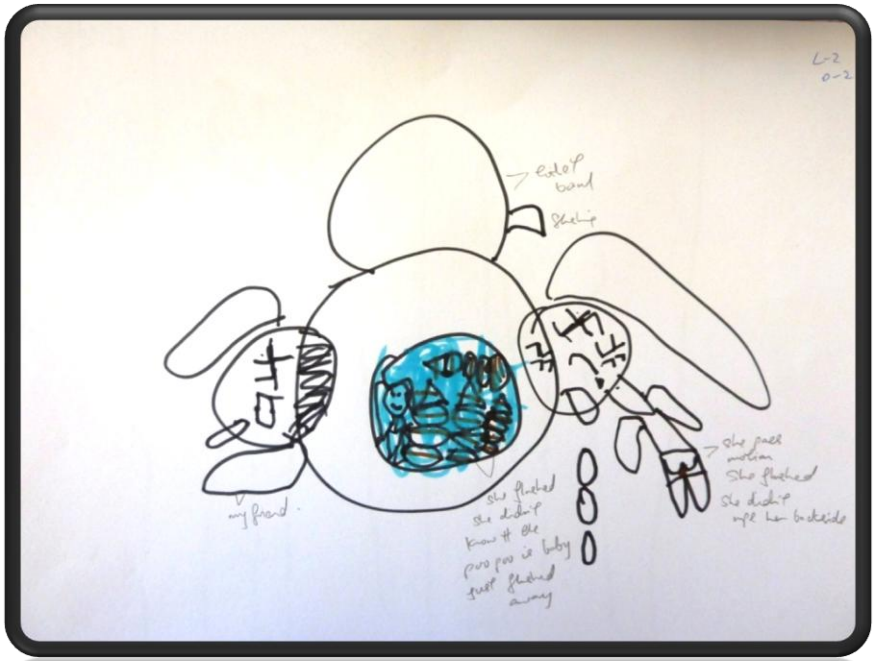
Appendix F6 (post) p.406



Child TM06

Appendix F7 (pre)p. 407

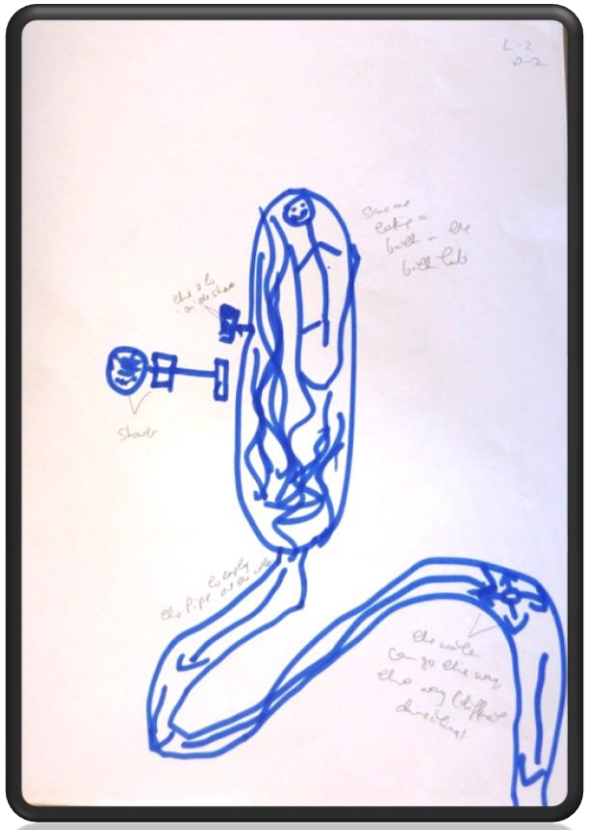
Appendix F8 (post) p. 408



Child TM08

Appendix F9 (pre) p. 409

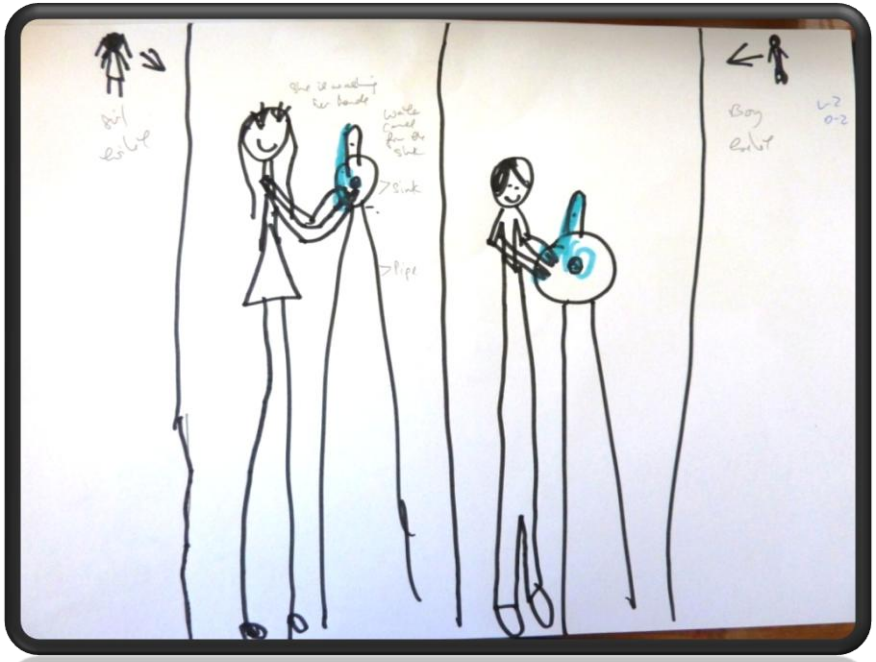
Appendix F10 (post) p. 410



Child TM11

Appendix F11 (pre) p. 411

Appendix F12 (post) p. 412



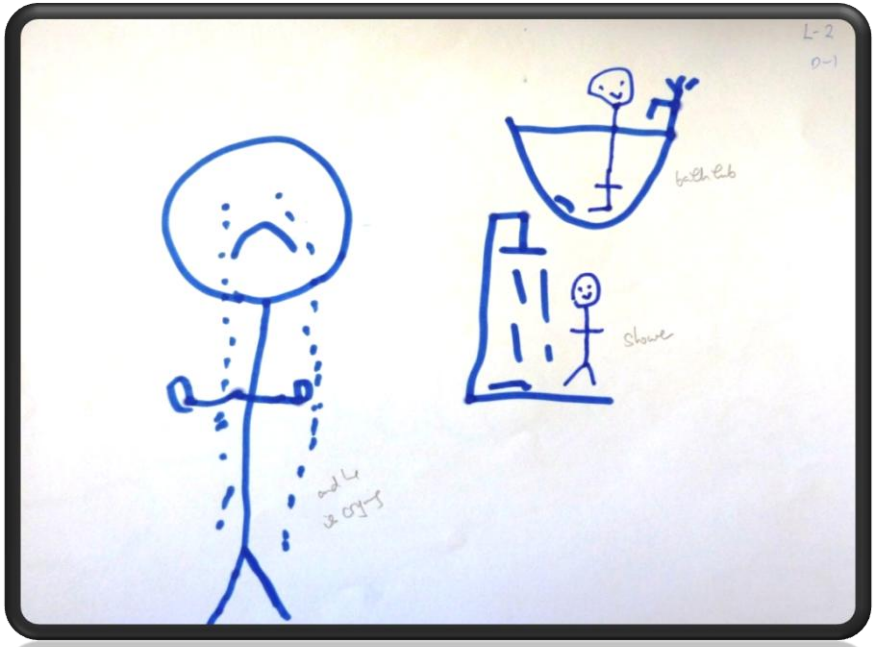
Child TM10

Appendix F13 (pre) p. 413

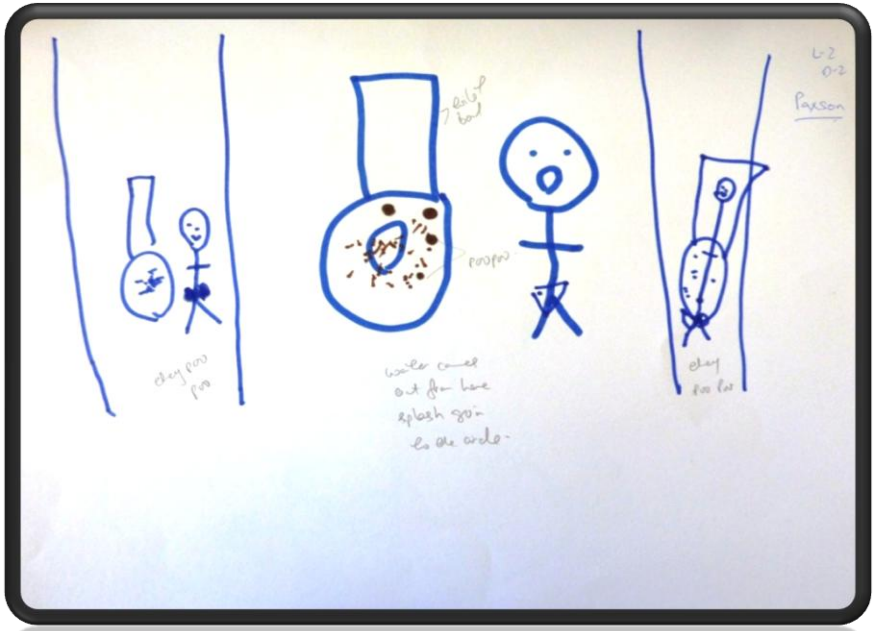
Appendix F14 (post) p. 414

Child TM07

Appendix F15 (pre) p. 415

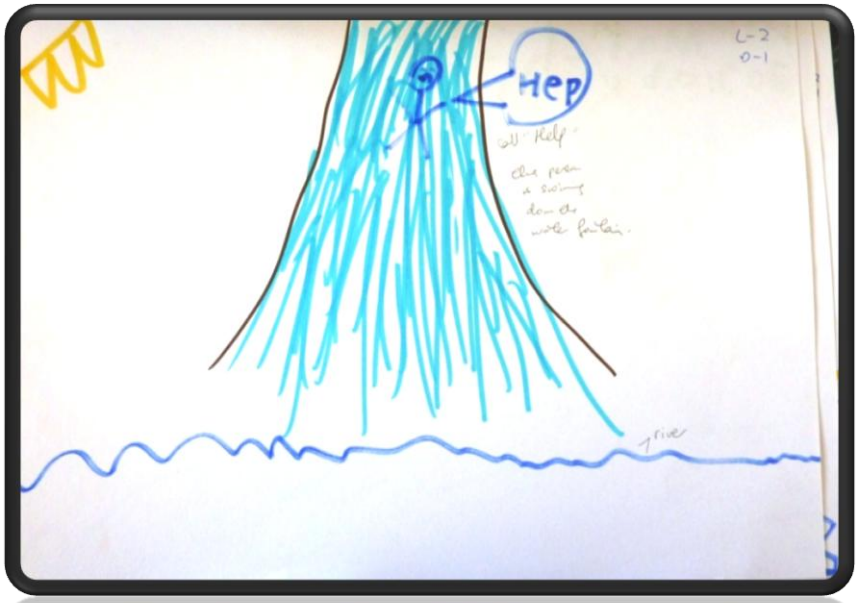


Appendix F16 (post) p. 416



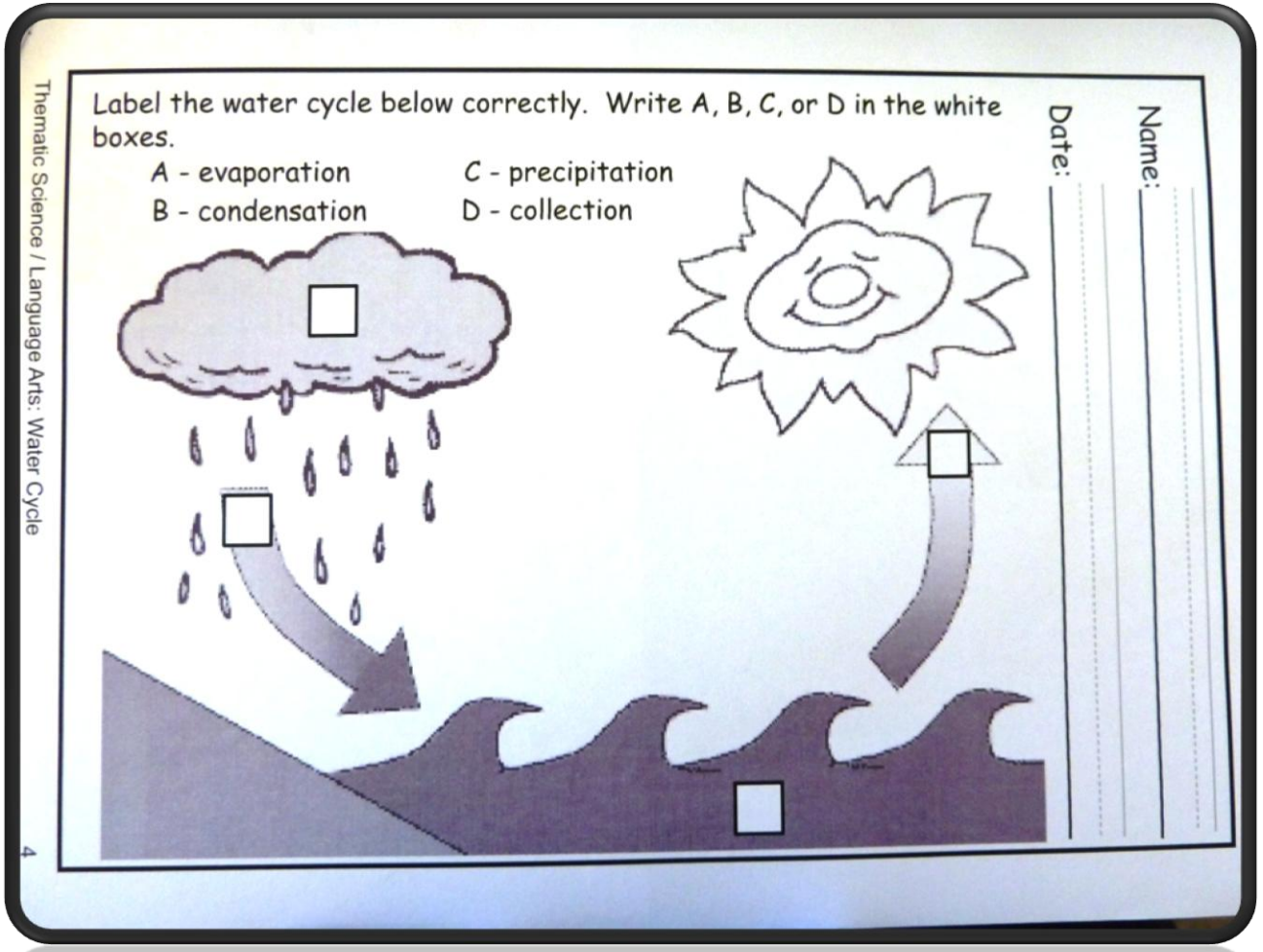
Child TM05

Appendix F17 (pre) p. 417



Appendix F18 (post) p. 418

Appendix F19 Worksheet p.419



Child TM09

Appendix F20 (pre) p. 420

Appendix F21 (post) p. 421

Child TM03

Appendix F22 (pre) p. 422

Appendix F23 (post) p. 423

Water Cycle Information Item Checklist 14 April 2012

	Water Cycle Information Item	TM01		TM02		TM03		TM04		TM05		TM06		TM07		TM08		TM09		TM10		TM11	
	Did the child draw	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
1	Cloud to begin	1			1													1		1	1		
2	Dark clouds		1									1										1	
3	Rain or raindrops	1	1		1											1		1		1	1	1	
4	Lightning	1																				1	
5	Thunder											1											
6	Collection of water e.g. river, sea, ocean, pool, puddle			1	1	1	1			1	1	1				1		1	1	1	1	1	
7	Sun			1						1								1					
8	Wind																						
9	Landscape	1	1	1	1					1	1							1		1	1	1	
Did the child draw or imply by inferring (V=Verbal)																							
1	Precipitation – rain comes from the clouds	1	1		1							1						1		1	1	1	
2	Evaporation – the sun heats up/dries up water																						
3	Condensation – cold water thus water droplets																						
4	Collection – Rain/water consummates into ocean, sea, river			1	1		1V			1	1							1		1	1	1	
5	Water cycle – Water changes in state and forms ie. Gas, liquid, solid																						
6	Water transmission/movements from one location to another															1	1			1	1		1
7	Water temperature- Hot and cold water differentiation						1	1			1	1											
8	Forces of water (powerful) e.g. wash away; drown					1			1	1													
Others																							
1	Mermaids	1																		1	1		
2	Waterfall	1																					
3	Rainbow		1													1		1		1	1		
4	Cruise ship		1																	1	1		

5	Sail boat			1															
6	Jetty			1															
7	Fish swimming in water				1									1		1			
8	Flavour sea					1													
9	Water collected in a washing basin						1												
10	Water collected in toilet bowl						1				1		1						
11	Fountain							1	1										
12	Duck swimming in water								1										
13	Swimming pool with ladder									1									
14	Baby, mummy & friend										1								
15	Boy-water collected in bath tub											1			1				
16	Boy crying with tears flowing down										1	1		1					
17	Boy showers with water flowing down										1	1	1	1					
18	3 boys poo poo in toilet bowls																		
19	Bridge & river flowing under													1					
20	Shower, drainage pipe													1	1				
21	stars															1			
22	Apples & oranges floating on sea																1		
23	Princess stays inside castle by a river																1		
24	Ocean water goes into the drainage pipe																	1	1
25	Whale, dolphin, carrot																	1	1
26	Boy & girl toilet with long pipings for water to flow																		1

NAME: _____ ***MALE/FEMALE**
DRAWING THEME: _____**DRAWING NO: 1**_____
DATE: _____ **Email Add:**_____ **HP:**_____

Instructions:
Please rate the drawing in a scale of:
1 (Least Evidence of knowledge relative to pre-lesson drawing) to 5 (Most Evidence of knowledge relative to pre-lesson drawing)

1 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	Evidence	Pre-Lesson Drawing	Evidence	Post-Lesson Drawing
Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects *(see definitions below)*				
a. Able to identify & label the names of things/objects related to the theme. E.g. a house, a tree, a bird etc				
b. Able to identify & label the names of people related to the theme E.g.. this is mummy, daddy, baby etc.				
c. Able to identify & label by naming the events related to the theme E.g. a birthday celebration, picnic				

REMARKS:

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
***Interpreting* by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material** *(see definitions below)*				
a. *Able to give examples by illustrating how things/objects function or associate with something else related to the narrative/theme in their drawing . E.g. The police car and the ambulance always together when there is an accident.*				
b. *Able to give examples by illustrating how people function or associate with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital*				
c. *Able to give examples by illustrating how actions function or associate with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*				

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
***Classifying* by categorizing/subsuming things/events /people/objects according to functions/ placement etc.** *(see definitions below)*				
d. Able to classify by organising/ categorizing *things/objects* according to functions/ purposes/ placement etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)				
e. Able to classify by organising/categorizing *events or experiences* according to occasions / causes etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc.				
f. Able to classify by organising/categorizing *people* according to functions/gender/relationships/occupation/ placement etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.				

REMARKS:

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*				
g. Able to conclude/predict understanding by comparing & explaining the causal-effect of *things/objects* in their drawing. E.g. the little boy threw the ball so the window broke.				
h. Able to conclude/predict understanding by comparing & explaining the causal-effect of *events* in their drawing. E.g. the two children quarrelled because they refused to share the toy.				
i. Able to conclude/predict understanding by comparing & explaining the causal-effect of *people* in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car				

REMARKS:

3 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*				
a. Execute by carrying out in drawing a procedure to determine *what/where/how/when/why things/objects* are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.				
b. Execute by carrying out in drawing a procedure to determine *what/where/how/when/why people* come from and where they go. E.g. mummy comes from the office to pick me up from school and we are going home now.				
c. Execute by carrying out in drawing a procedure to determine *what/where/how/when/why events* happen and its outcome. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.				

REMARKS:

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*				
a. Differentiating *people/events/ things/objects* by **distinguishing / selecting** relevant from irrelevant parts or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.				
b. Organizing *people/events/ things/objects* by **finding coherence / structuring** how elements fit or function within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.				
c. Attributing *people/events/ things/objects* by **deconstructing to determine a point of view, bias, values, or intent underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.				

REMARKS:

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*				
a. Checking by drawing to determine things e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.				
b. Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing) of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.				

REMARKS:

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**Evidence**	**Pre-Lesson Drawing**	**Evidence**	**Post-Lesson Drawing**
Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*				
a. Generate by coming up with alternative hypotheses based on criteria to account for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.				
b. Plan by designing a procedure to accomplish a task in drawing e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.				
c. Produce by constructing or inventing in drawing a model or product e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-				

REMARKS:

Children's Drawing Analysis Workshop

By Rebecca Chan

Drawing Themes

Preschool	Chn/Age	3-day Lesson Theme
PKA Childcare Centre	15 / 6-yrs	**Wild Animals** 1. Draw and name the wild animals 2. Animals and their young 3. Food that animals eat
TyMC Kindergarten	11/6 yrs	**Water** 1. Can you draw and name the different forms/types of water? 2. Draw where does water come from and where it goes (Water cycle) 3. Water pressure: what can water do for us?

Knowledge & Cognitive Process

Factual Knowledge

- Knowledge of terminology
- Knowledge of specific details and elements

Conceptual Knowledge

- Knowledge of classification and categories
- Knowledge of principles and generalizations
- Knowledge of theories, models, and structures

Knowledge & Cognitive Process

Procedural Knowledge

- Knowledge of subject-specific *skills* and algorithms (p53)
- Knowledge of subject-specific *Techniques and Methods* (p.54)
- Knowledge of *criteria* for Determining when to use appropriate procedures (p54**)**
- ***Is the knowledge of 'how' to do something*** (p62)

Knowledge & Cognitive Process

Metacognitive Knowledge

- Strategic Knowledge
- General Strategies
- Knowledge about cognitive tasks, including contextual and conditional knowledge
- Self-knowledge

6 Cognitive Processes

1. **REMEMBER**

- Recognizing, recalling, retrieving
- By identifying and labeling
- Matching activity

6 Cognitive Processes

2. **UNDERSTAND** – why?

a. *Interpretation* by giving examples – through action, music, art, writing

b. *Classifying* by organizing/categorizing/ grouping

- Things/objects
- Events/experiences
- People/gender, functions, relationships

c. *Inferring* by

- *Comparing, explaining, predicting*
- Causal-effect relations

6 Cognitive Processes

3. **APPLY – HOW/WHERE**

- Execute a procedure to find out how elements are involved in the process
- Where things come from and go?
- What's the outcome of this coming & going e.g. water cycle; womb/baby; flower cycle

6 Cognitive Processes

4. **ANALYZE – WHY/HOW**

- Differentiating by distinguishing/select relevant from irrelevant
- Discriminating
- Distinguishing
- Focusing
- selecting

- Organizing – many parts make one whole structure e.g. birthday party theme drawing
- Attribute – to consider as by determining a view, bias, value

6 Cognitive Processes

5. **EVALUATE**

- Judge by checking criteria & standards
- Coordinating, Detecting, Monitoring, Testing
- Is it logical/illogical?
- Consistency/inconsistency?
- Accurate/inaccurate?

6 Cognitive Processes

6. **CREATE**

- Generating by coming up with alternative hypotheses
- Planning by designing a procedure
- Producing by constructing/inventing

Animals & their Young
Lesson Objectives

1. Learn the names of the animals' babies e.g. cub, calf, joey, fawn
2. Enhance their memory skills

Teacher think the chn might know – cub, calf, kitten, puppy, chick

Animals & their Young

Rating Instructions

- ***Please rate the drawing in a scale of:***
- ***<u>1</u> (Least Evidence of knowledge in quantity &/or quality)***
- ***to <u>5</u> (Most Evidence of knowledge in quantity &/or quality)***
- ***<u>Please support your rating with evidence as indicated in the drawing</u>***

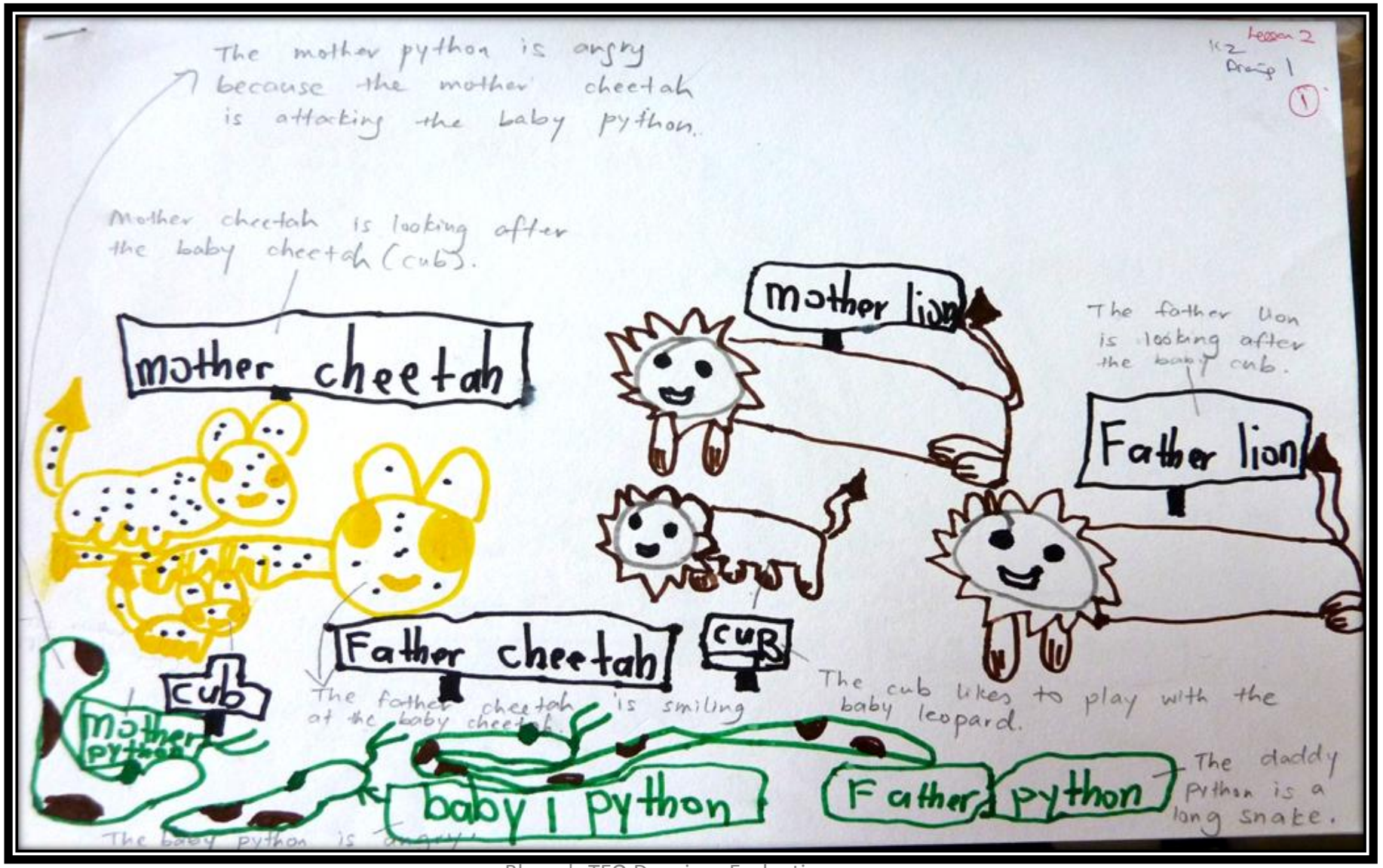
Rating Instructions

- Please write your name & particulars
- The notes written in pencil on the drawings are the stories/explanations given by the child
- You may write on the ‘remark’ row or use the back of the paper for additional comments.
- FEEDBACK – please write you honest feedback what you think about the rating checklist (strengths/weaknesses) to help improve on it.

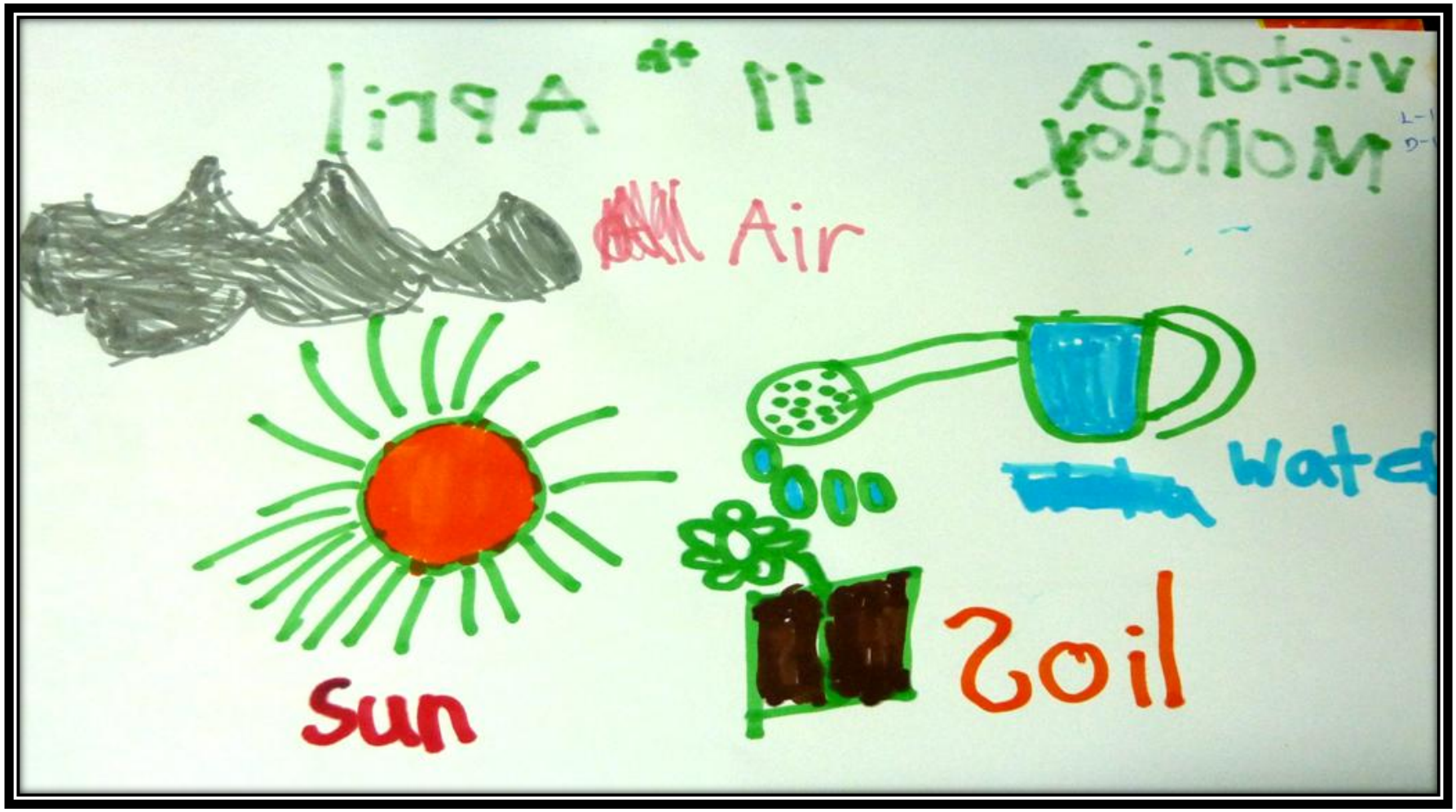
1. Remember (identify & label)

REMEMBER *Please rate the drawing in a scale of 1 (Least Evidence) to 5 (Most Evidence)*	The evidence as seen in the drawing to support my rating...	MY RATING
Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects		
a. Able to ***identify & label the names of things/objects related***	Mother/father -lion, baby python, cheetah, cub	4
b. Able to ***identify & label the names of people related to the theme*** E.g.. this is mummy, daddy, baby etc.	Hunter, zoo keeper/ NIL	2 / NIL
c. Able to ***identify & label by naming the events related to the theme*** E.g. a birthday celebration, picnic	Night Safari, zoo	3

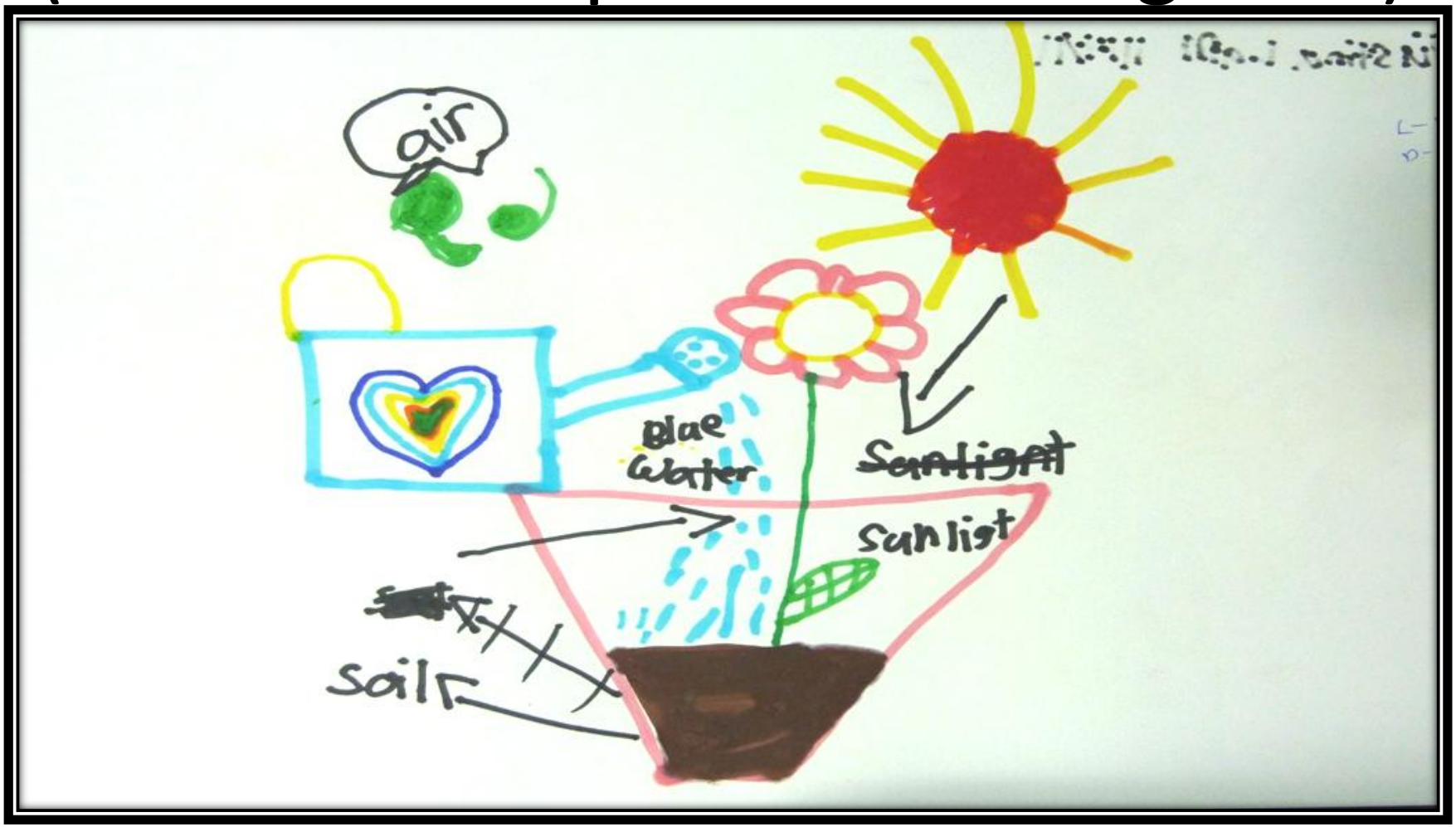
Animals & their Young



Theme: Plant
(What does a plant need to grow?)

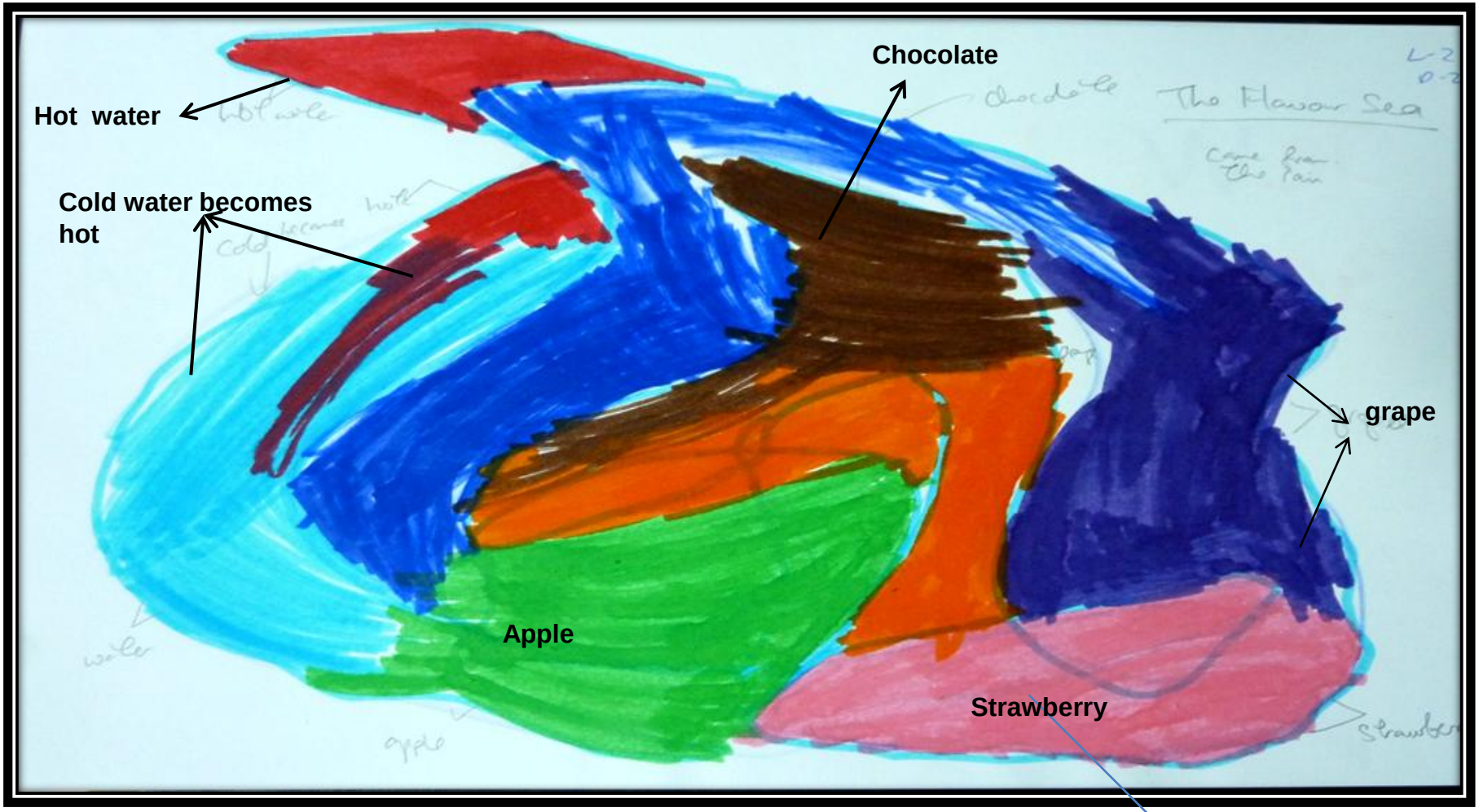


Theme: Plant
(What does a plant need to grow?)



Theme: Water

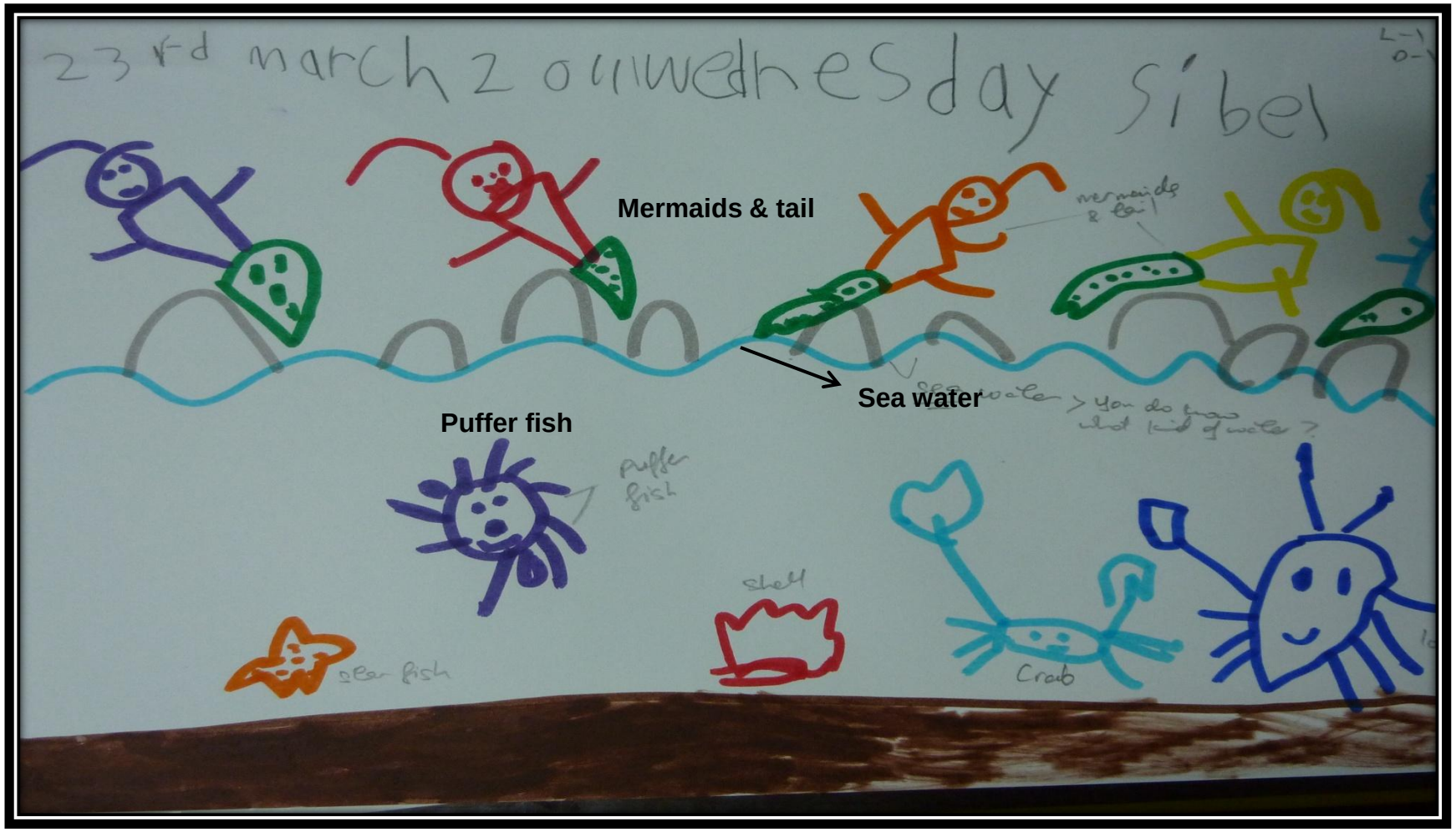
“The Flavor Sea come from the rain”



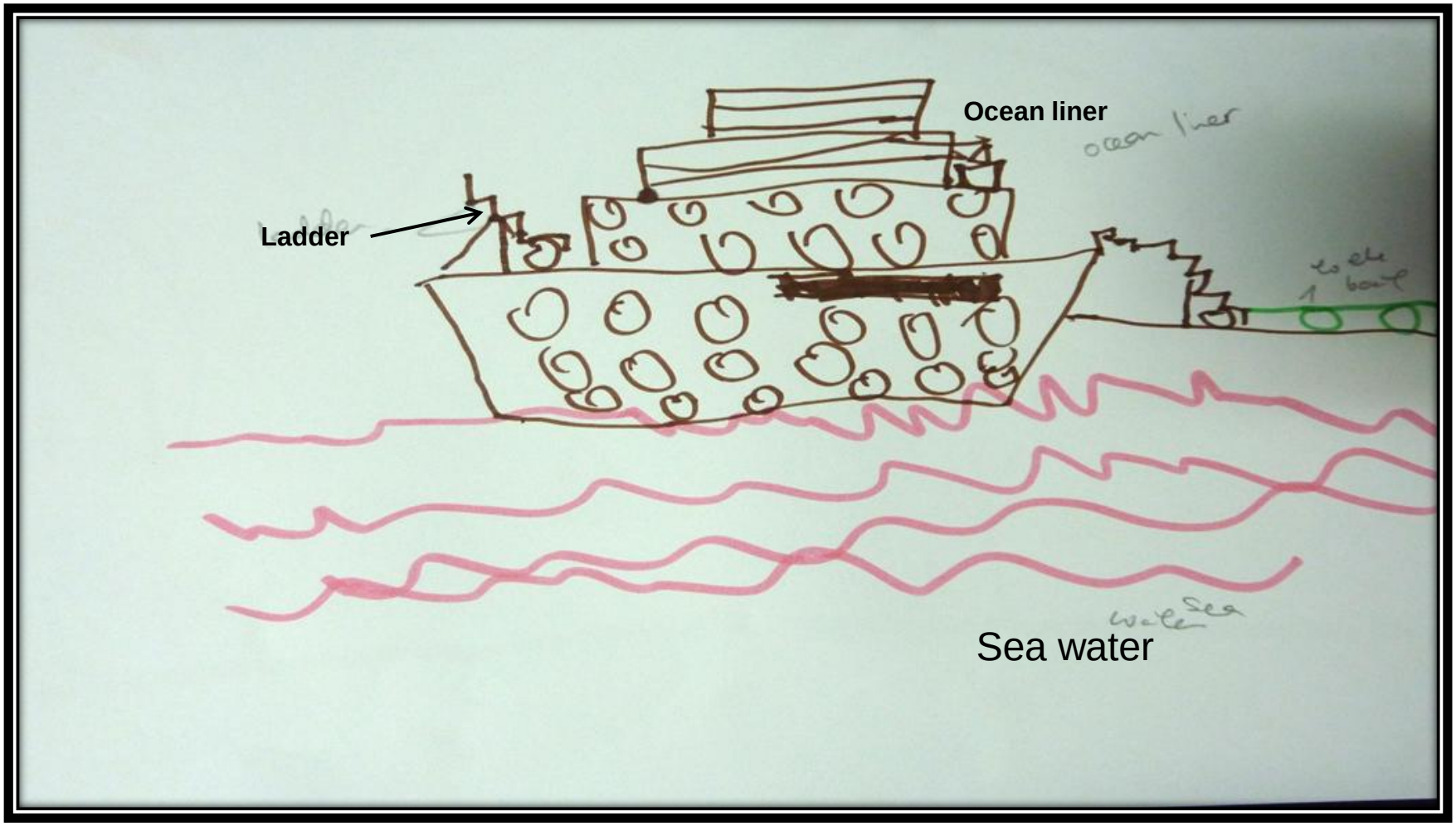
2. Understand
(interpret by clarifying/association)

2. UNDERSTAND ***Please rate the drawing in a scale of 1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**	**MY RATING**
Interpreting by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material *(see definitions below)*		
*a. Able to **give examples by illustrating how things/objects function or associate** with something else related to the narrative/theme in their drawing . E.g. The police car and the ambulance always together when there is an accident.*	Mother cheetah ***looks after*** baby cheetah; father lion looks after baby cub	4
*b. Able to **give examples by illustrating how people function or associate** with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital*		
*c. Able to **give examples by illustrating how actions function or associate** with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*	Cub likes to play with baby leopard	2

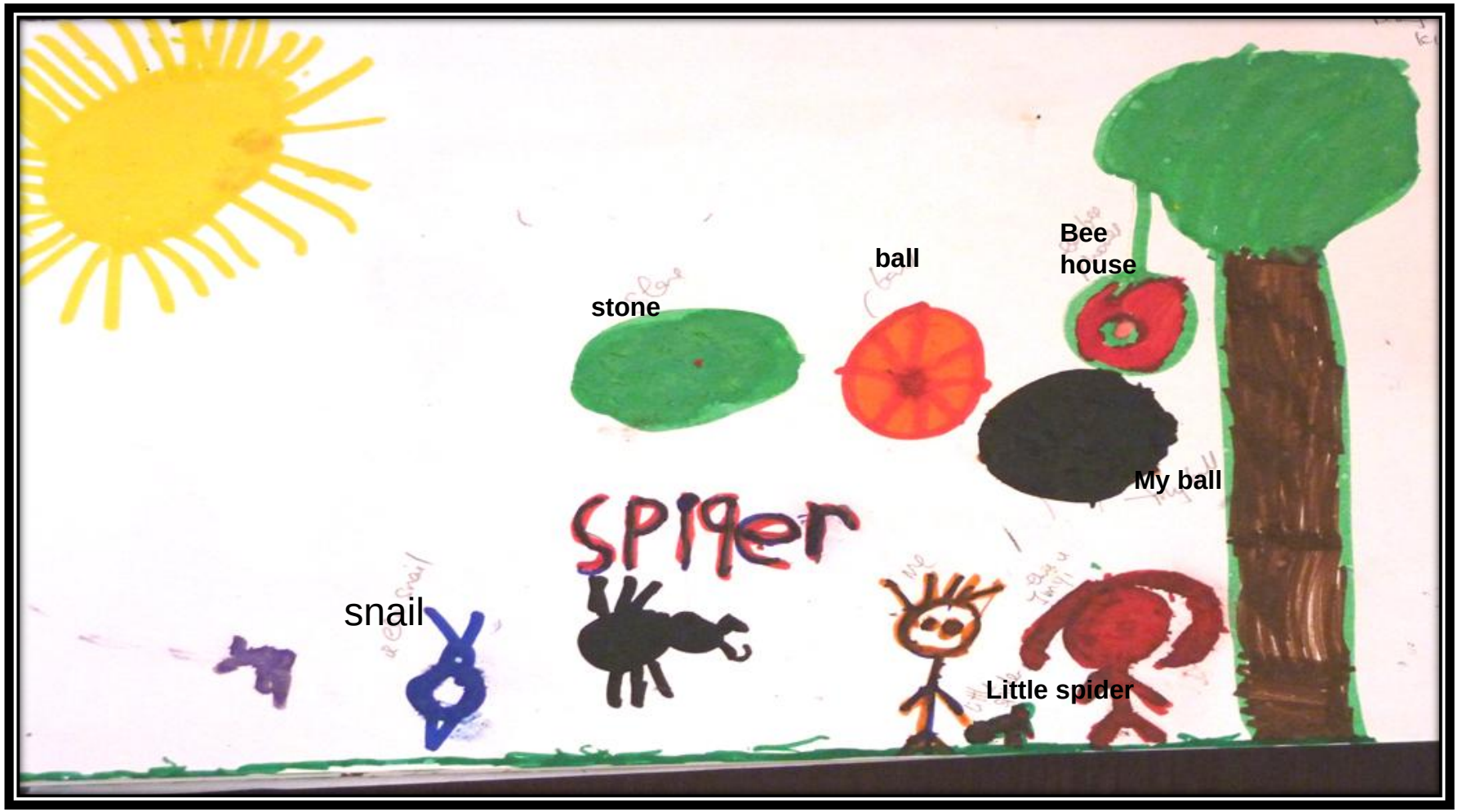
Theme: Water


23rd march 2011 wednesday Sibel
Mermaids & tail
Sea water
Puffer fish
Puffer fish
shell
Crab

Theme: Water



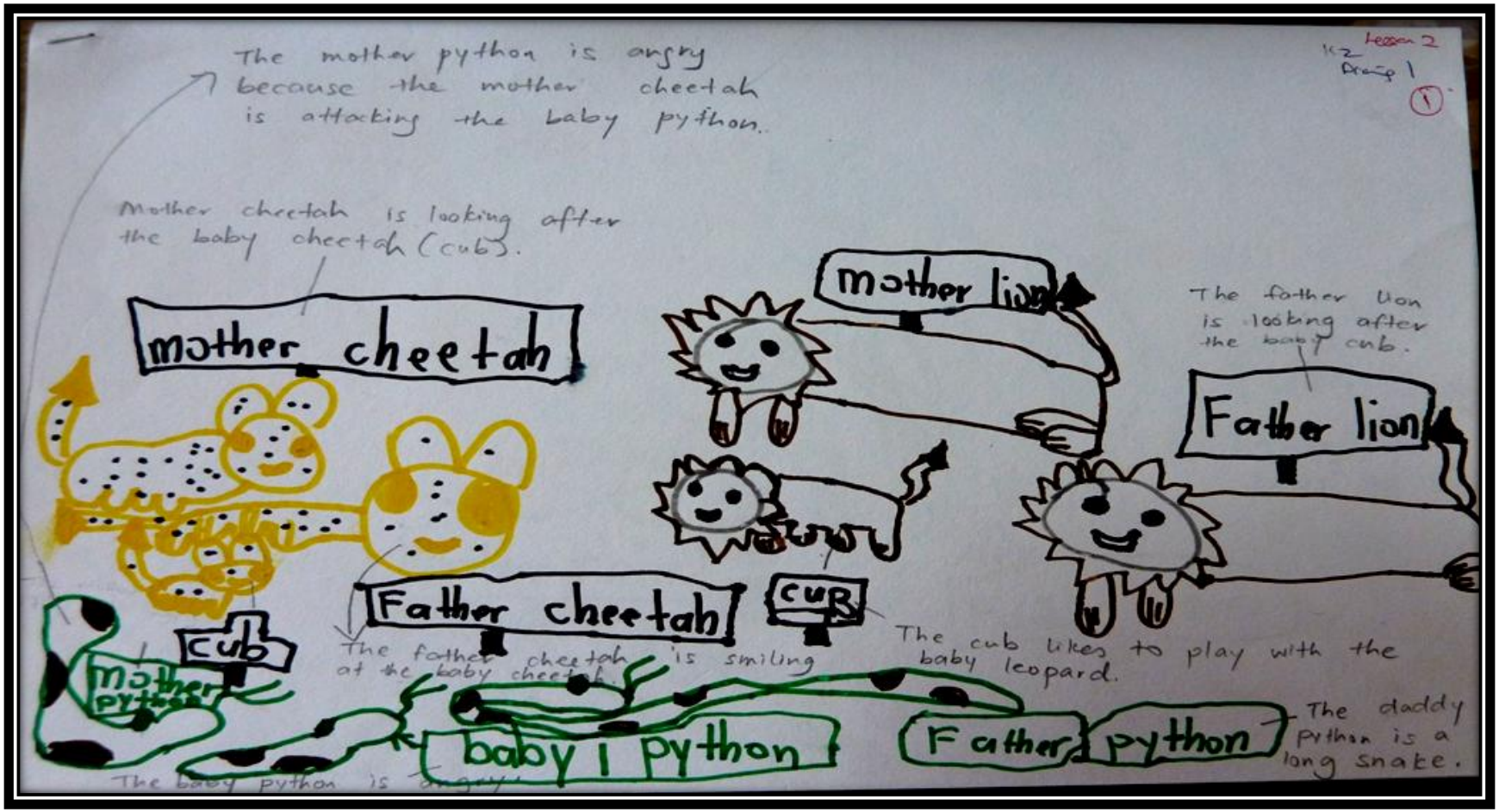
Theme: Creepy crawlies



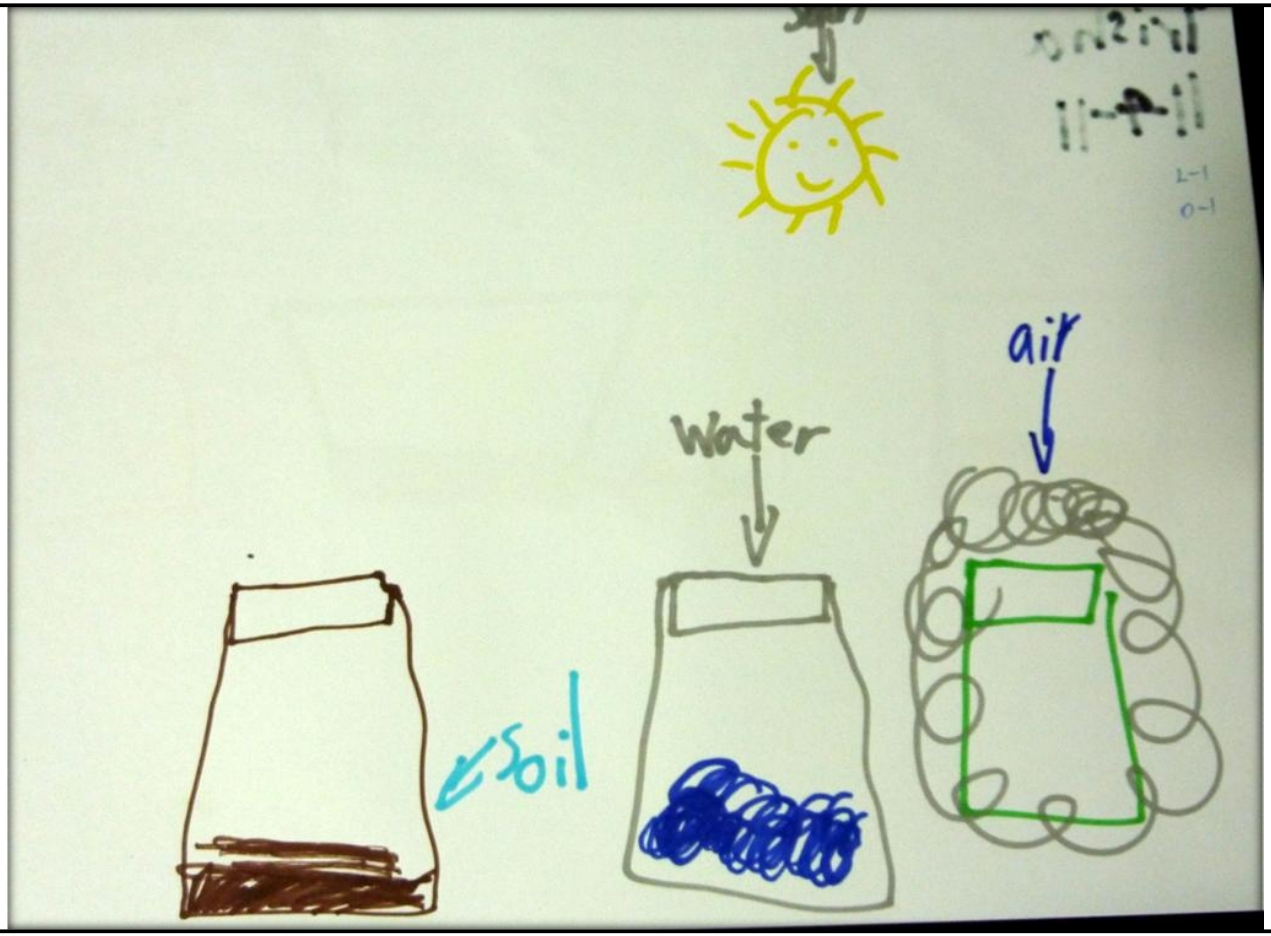
2. Understand
(classify by categorizing)

2. UNDERSTAND ***Please rate the drawing in a scale of 1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating…**	**My Rating**
Classifying **by categorizing/subsuming things/events /people/objects according to functions/ placement etc.** *(see definitions below)*		
d. Able to classify by ***organising/ categorizing things/objects*** **according to functions/ purposes/ placement** etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)	Classify python ground level. Lion & Cheetah mid ground level. individual Family unit **Child group individual family unit of 3 members in an enclosure together** **Concept of size relations Big, bigger, biggest**	4
e. Able to classify by ***organising/categorizing events or experiences according to occasions / causes*** etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc		
f. Able to classify by ***organising/categorizing people according to functions/gender/relationships/occupation/ placement*** etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.		

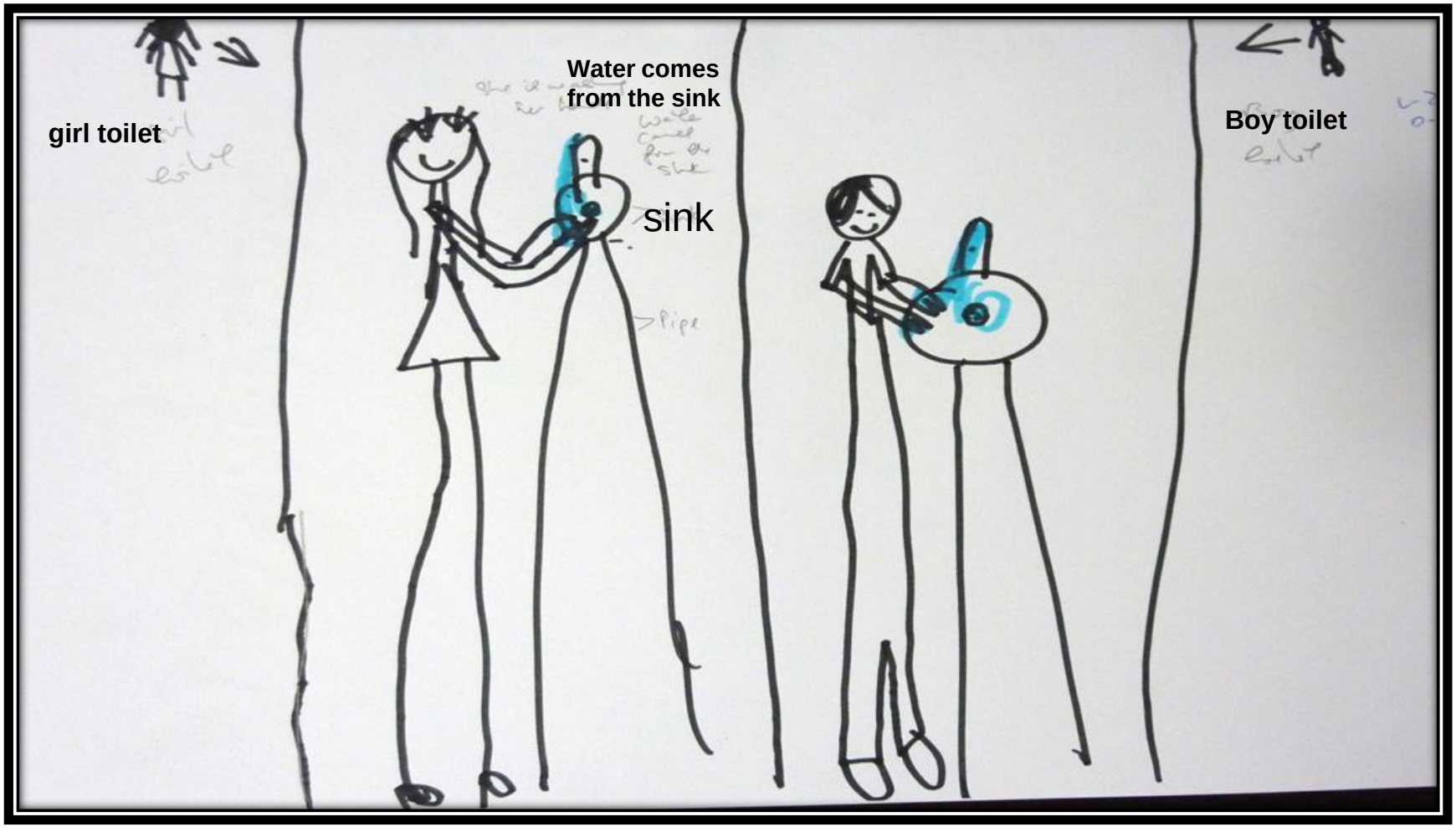
Theme: Animals & their young



Theme: Plant
(What does a plant need to grow?)



Theme: Water

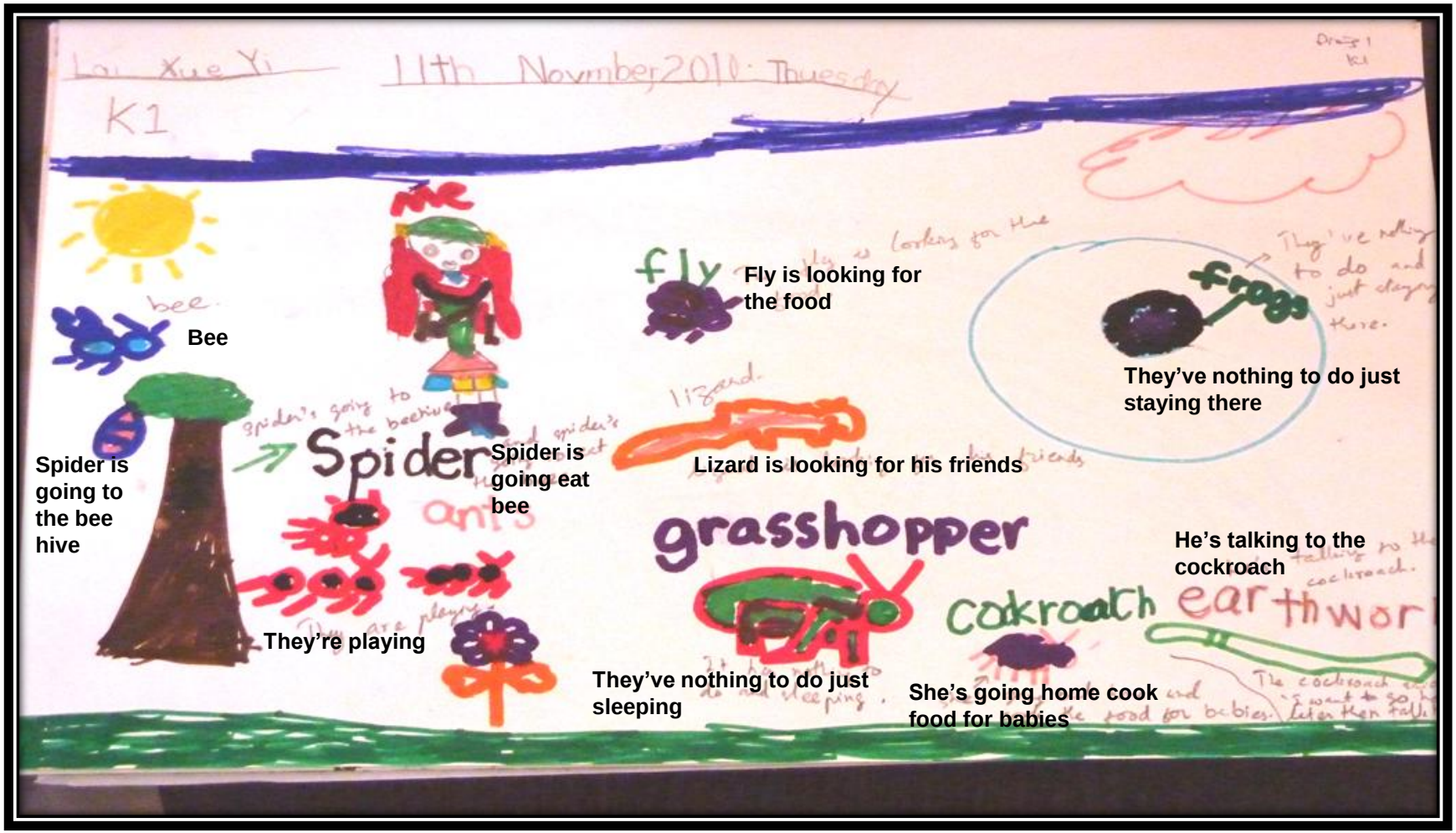



wednesday 30th March 2011
sibel tah
Ocean Name:
River/water
mermaid
Star
cruise
raining
Someone
threw carrot
in the ocean
Water all go into
the drain
drain
dolphin
whale

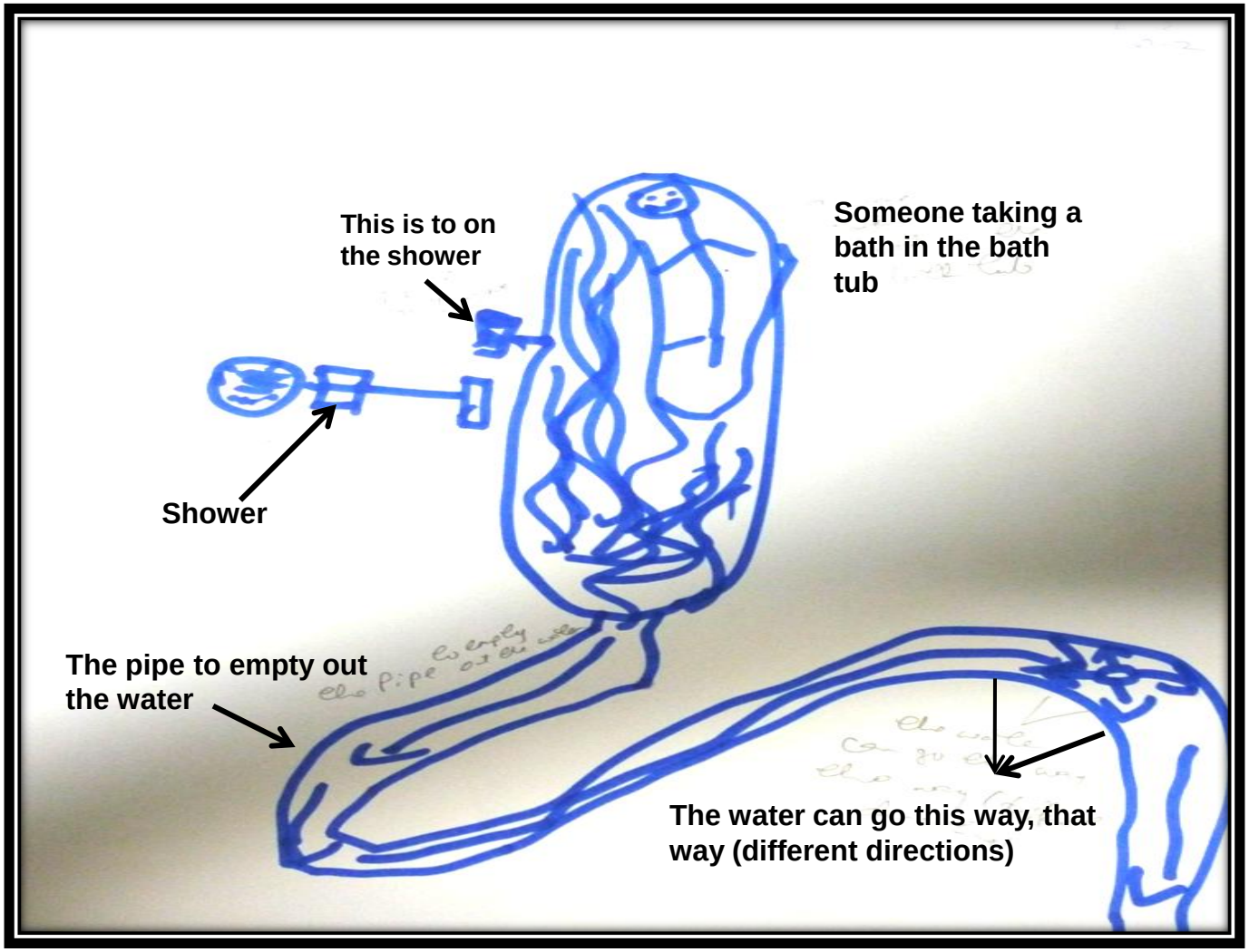
2. Understand
(Inferring/comparing/explaining,predicting)

2. UNDERSTAND ***Please rate the drawing in a scale of 1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating…**	**My Rating**
Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*		
a. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of things/objects*** in their drawing. E.g. the little boy threw the ball so the window broke.	M. Python is angry becos M cheetah attack B.python	3
a. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of events*** in their drawing. E.g. the two children quarrelled because they refused to share the toy.		
a. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of people*** in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car		

Theme: Creepy crawlies



Theme: Water


This is to on the shower
Someone taking a bath in the bath tub
Shower
The pipe to empty out the water
The water can go this way, that way (different directions)

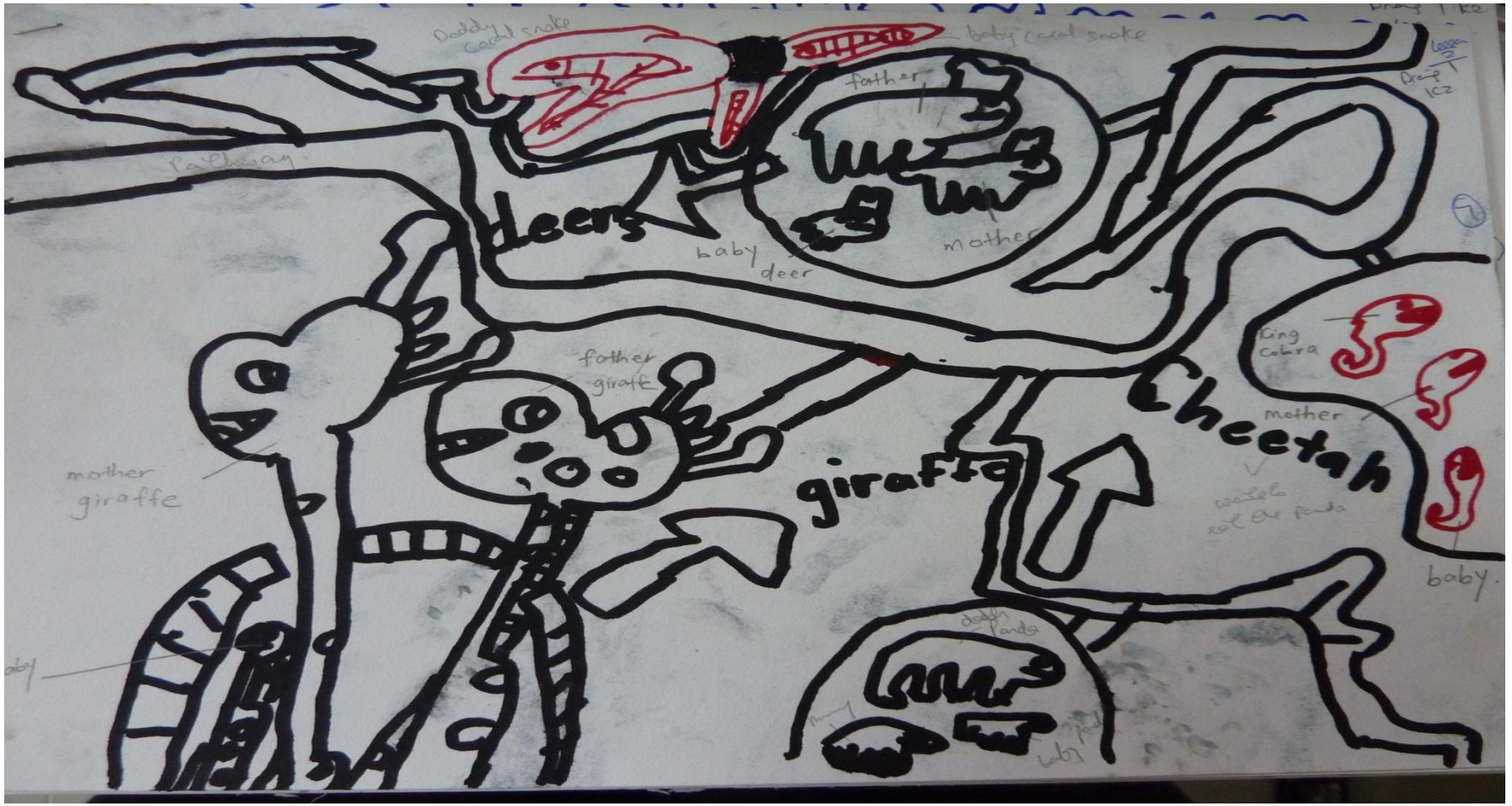
Plant

3. Apply

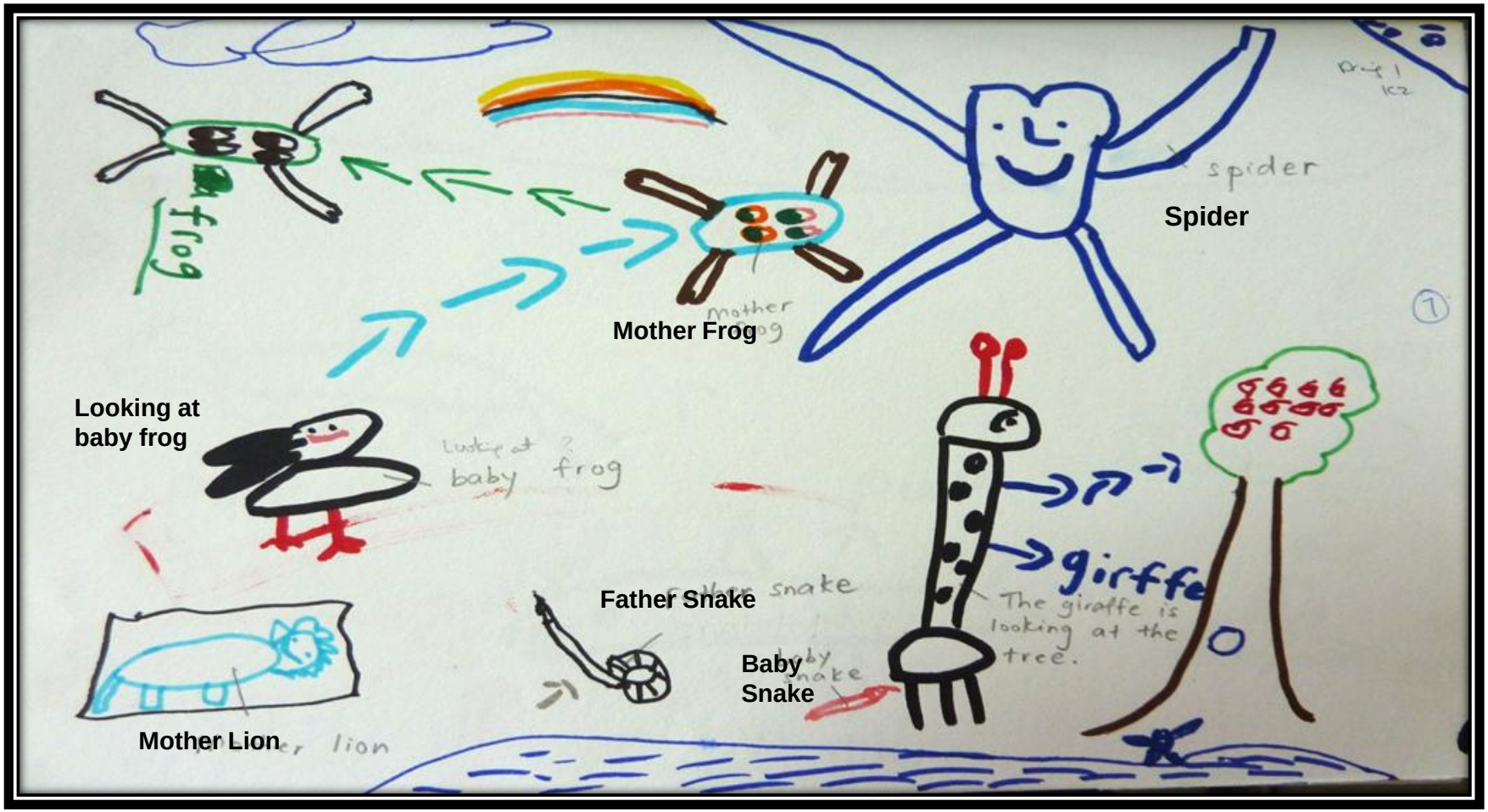
(to find out where things come from or where it goes)

3. APPLY	The evidence as seen in the drawing to support my rating…	My Rating
Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*		
a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why things/objects*** are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.	**Map-like path way leading to enclosures**	
a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why people come from and where they go.*** E.g. mummy comes from the office to pick me up from school and we are going home now.		
a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why events happen and its outcome***. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.		

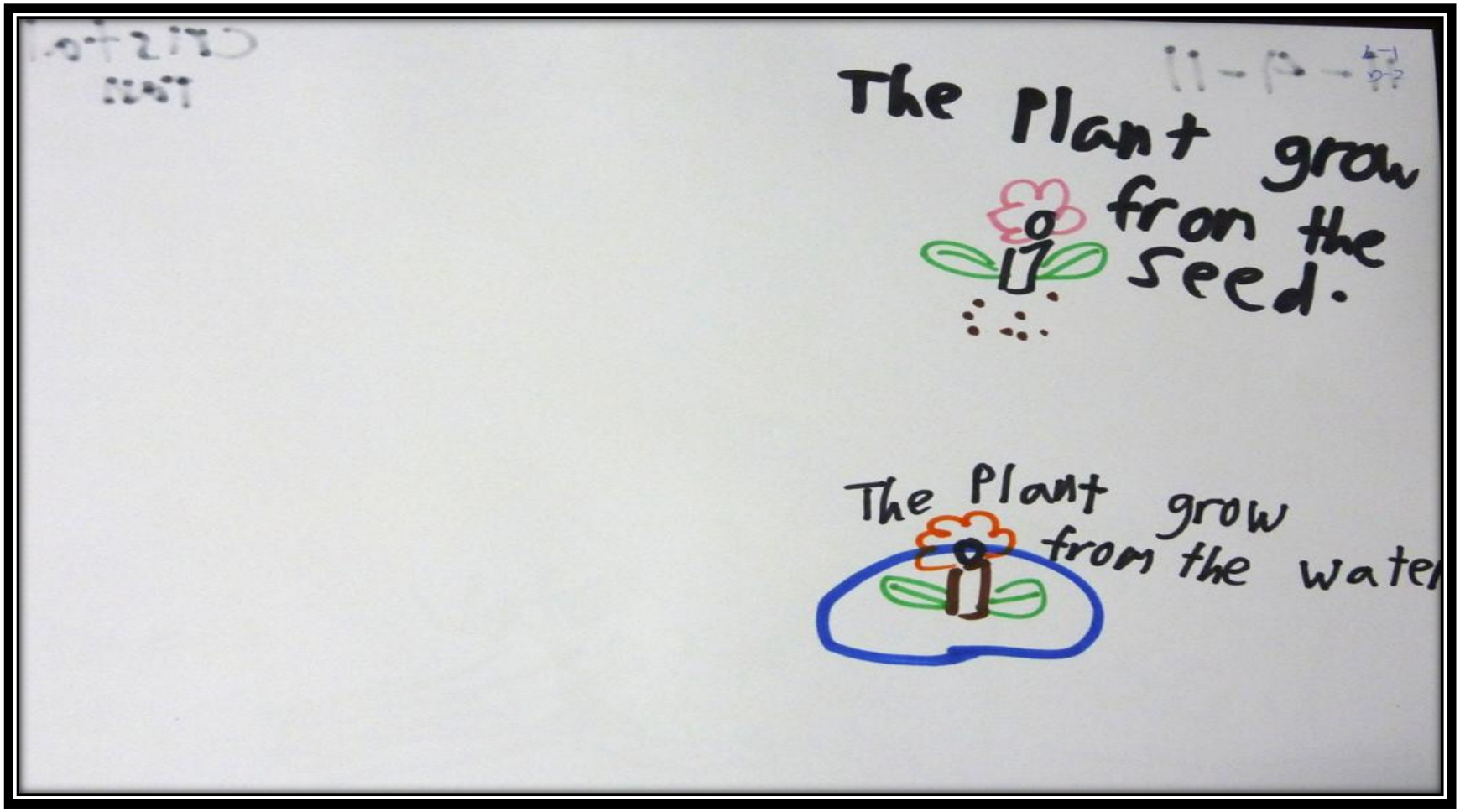
Procedural Knowledge

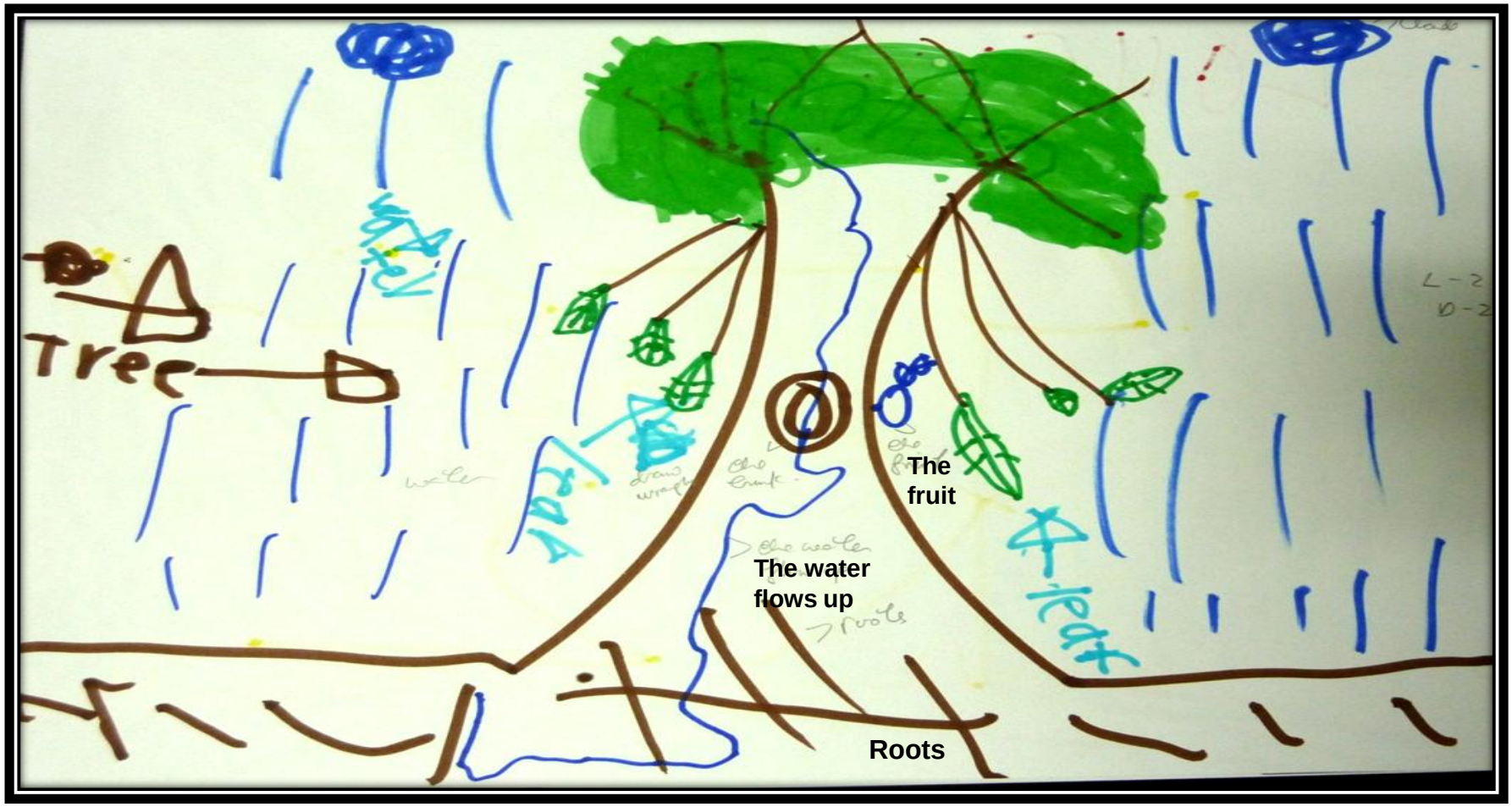


Procedural Knowledge



Plant

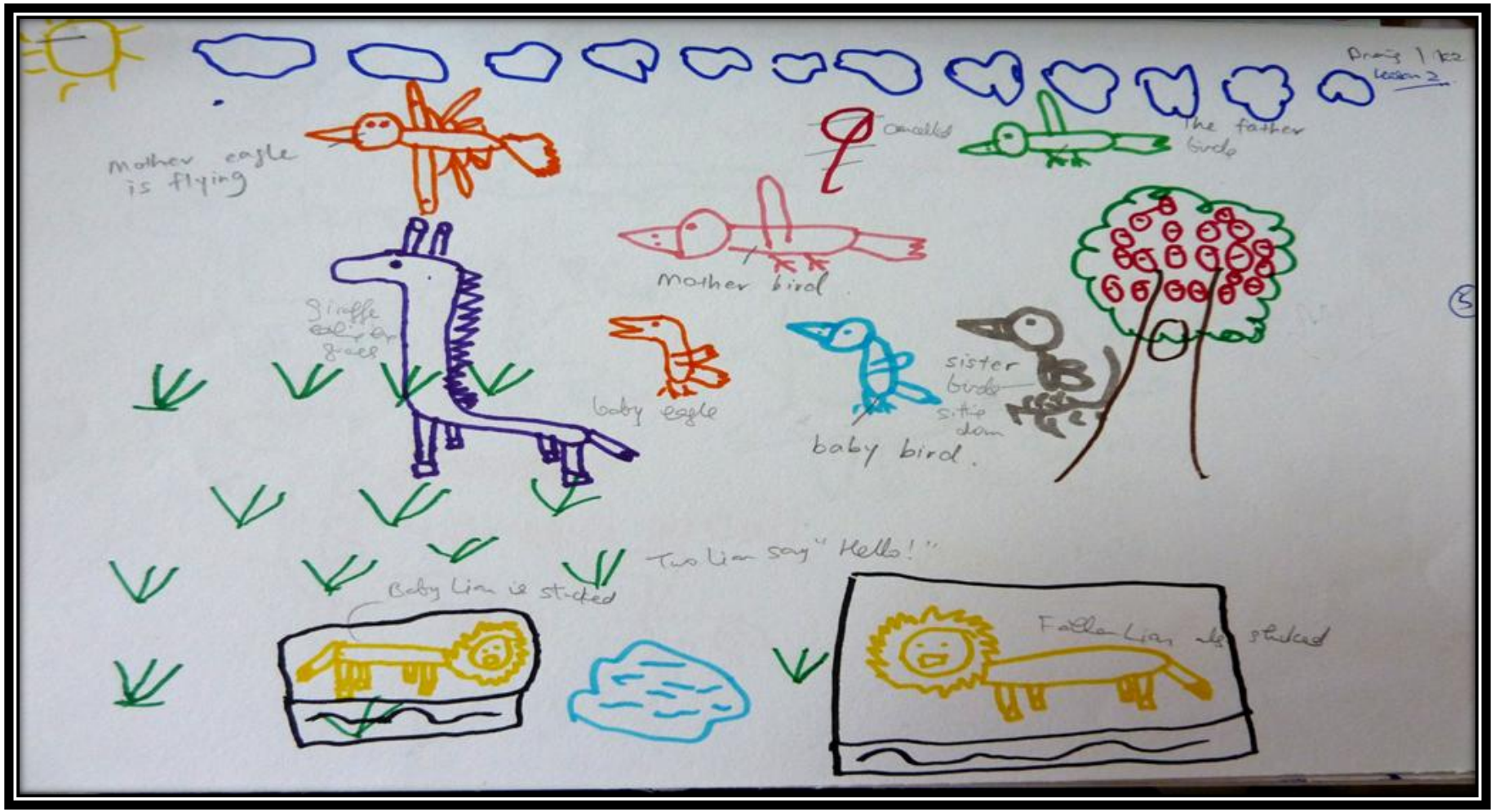



Tree
The fruit
The water flows up
Roots

4. Analyze
(by differentiating, organizing & attributing)

4. ANALYZE	The evidence as seen in the drawing to support my rating…	My Rating
Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*		
a. ***Differentiating people/events/ things/objects by distinguishing / selecting relevant from irrelevant parts*** or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.		
a. ***Organizing people/events/ things/objects by finding coherence / structuring how elements fit or function*** within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.	Animals & young	
a. ***Attributing people/events/ things/objects by deconstructing to determine a point of view, bias, values, or intent*** **underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.		

Analyze


Mother eagle is flying
mother bird
baby eagle
baby bird.
sister bird
Baby Lion is sticked
Father Lion is sticked

Plant/trees


L-2
D-2
The fruit protects the seed.
The ~~root~~ trunk help the water to go up to the other parts of the tree.
The roots help the tree to balance

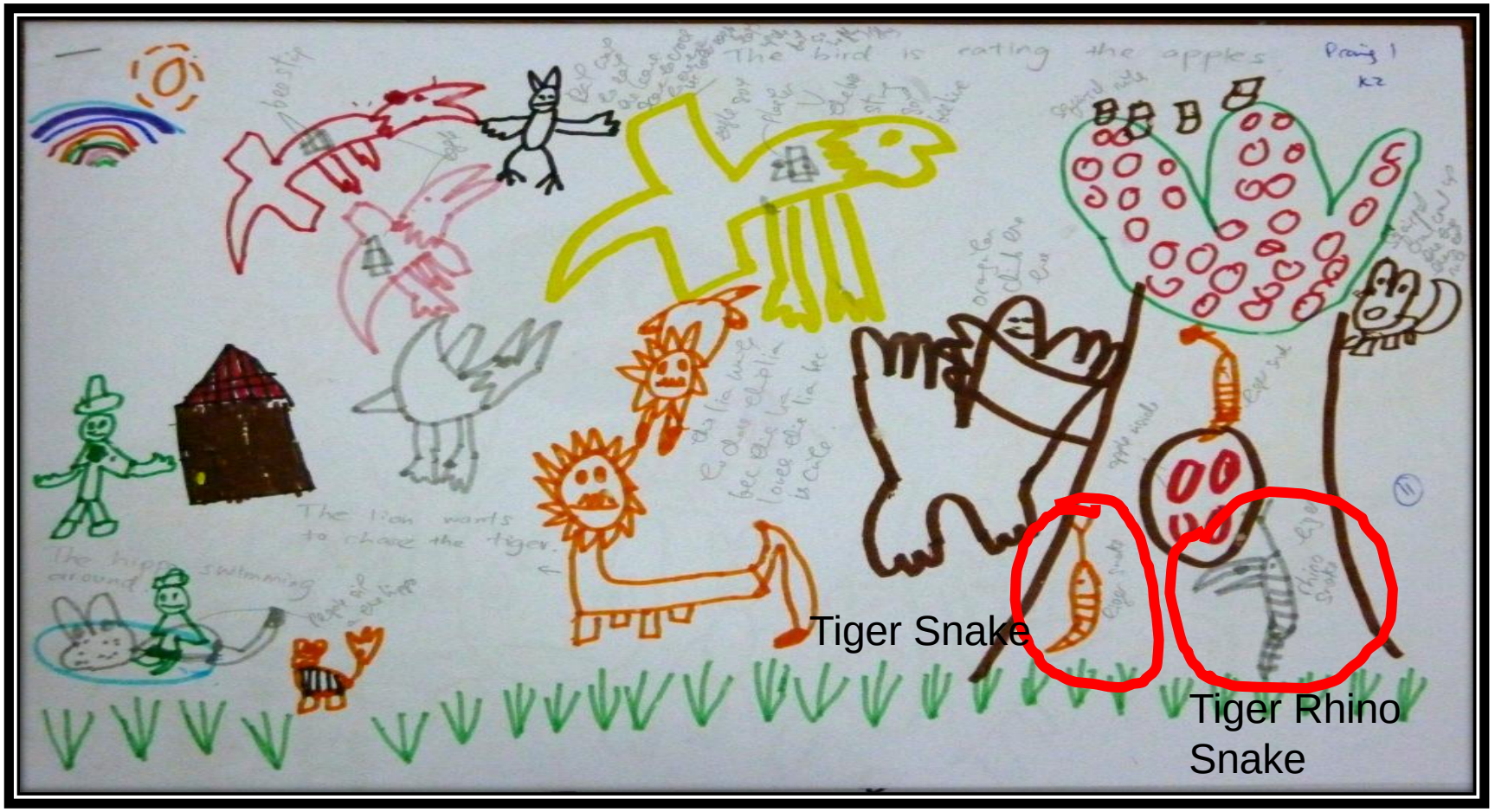
5. Evaluate (judgment-criteria & standards)

5. EVALUATE	The evidence as seen in the drawing to support my rating...	My Rating	
Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*			
a. ***Checking by drawing to determine things*** e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.			
a. ***Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing)*** of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.		Plaster/ diaper	


Rainforest
The parrots are hungry.
The baby parrot eats the diaper.
The eagle has a plaster on its body.
The butterfly is shining.
The tiger is very angry because there is no food to eat.
The girl is crying because there are no apples.
pond.

6. CREATE
(new ideas/structures/things)

6. CREATE	The evidence as seen in the drawing to support my rating...	My Rating
Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*		
a. ***Generate by coming up with alternative hypotheses based on criteria to account*** for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.		
a. ***Plan by designing a procedure to accomplish a task in drawing*** e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.		
a. ***Produce by constructing or inventing in drawing a model or product*** e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-		


Tiger Snake
Tiger Rhino Snake


Porcupine
Fish

Rainbow Face

1 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects *(see definitions below)*

a. Able to ***identify & label the names of things/objects related to the theme***. E.g. a house, a tree, a bird etc

Respondents' supporting evidence

Drawing **Descriptions**

BEFP10 Child labelled animals on his own e.g. wolf, turtle, kind cobra, lion
BEFP10 Able to spell words independently
BEFP10 Child was able to label with correct spelling
BEFP10 Wolf, turtle, wolf, lion, King cobra
AFTP10 Child is able to recognise label animals e.g. wolf, lion
AFTP10 Iguana, birth eagle, gorilla, monkey, lion, bat, orang utan, rhinoceros, wolf
AFTP10 Name animals eg. Wold, rhinoceros, eagle, iguana

BEFP11 Squirrel nuts
BEFP11 orangutan, lion, bat, bee, tigersnake, squirrel
BEFP11 Bee, bat, plaster, squirrel, bird, orang utan, lion, tiger snake, hippo, people
BEFP11 Can draw some of the animals listed
AFTP11 bat, rhino, porcupine fish, lion, giraffe
AFTP11 Bat, rhino, lion etc.
AFTP11 Mandrill, rhino, bat, porcupine fish

BEFP12 Tiger, lion, giraffe, tree, sun etc.
BEFP12 Porcupine, sun, tree, tiger etc.

BEFP12 Child labelled names of animals and plants drew
AFTP12 Sun, clouds, giraffe as "giaffe", tiger as "trge, tegt", bat, lion,
AFTP12 Use inventive spelling for items

BEFP13 Giraffe, lion, python, bat, moon
BEFP13 Giraffe, porcupine, lion, python, bat – able to identify & spell the names
BEFP13 The child is able to identify sun, bat, moon, giraffe, lion, porcupine and python
AFTP13 Child is able to identify and label the animals/objects e.g. clouds, bat, sun, tree, giraffe, porcupine
AFTP13 Sun, moon, clouds, bat, tree, giraffe, lion, porcupine, rhinoceros, 4-eyed frog

BEFP14 Giraffe, lion etc.
BEFP14 Labels them correctly "Indian Rhino" "Porcupine" "lion" "crocodile" etc.
BEFP14 Able to label whatever that is drawn
BEFP14 Able to spell the name of animals accurately and associating it to the correct animal
AFTP14 Verbal labelling of giraffe; spelled & labelled rhino & bat
AFTP14 Able to label bat, rhino

BEFP15 Birds – eagles, parrot, other birds
BEFP15 Bird, eagle, fly, plaster, steel, mosquito, plaster, lion, snake
BEFP15 Lion, Eagle (egel)= written; Parrot, bird, mosquito, plaster (verbal)
AFTP15 Label most of what she drew
AFTP15 Able to identify different kinds of birds

1 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. Able to ***identify & label the names of people related to the theme*** E.g.. this is mummy, daddy, baby etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Clouds with sun & birds, snake with tree, orange on tree
BEFP01 tiegr, lion, king cobre, turtle
AFTP01 Child named 'witch' in the picture but is not related to theme
AFTP01 Child is able to associate 'witch' with spells/curses

BEFP02 The snake is in the water
BEFP02 Able to name the animals
BEFP02 Giraffe is eating a leaf; Koala bear crawling
AFTP02 Giraffe is smiling; frog eat the food
AFTP02 Monkey is hanging from stone tree

BEFP03 Label daddy rihino etc...
BEFP03 Able to differentiate mummy & babay
AFTP03 Daddy bear, tree frog, mummy bear, cup; girl, rhino, sea, sun, nature
AFTP03 Daddy, mummy, cup
AFTP03 Daddy, mummy
AFTP03 Mummy bear looking at somewhere to find food, birds that are friends flying together

BEFP04 The child writes it down
AFTP04 The man is sitting on the rhino
AFTP04 Child drew some wild animals but not those listed by the teacher
AFTP04 The man is riding on rhino holding on to stripes to avoid falling

AFTP04 Man riding on the rhino

BEFP06 Bat hanging upside down
AFTP06 No people in drawing but mentioned that people took apples from tree
AFTP06 Name the habitat

BEFP07 Butterfly survive by feeding on nectar; tiger is a meat-eater
BEFP07 Three rainbows with trees

BEFP08 Not able to relate to name of people but understand animals relate to tree

BEFP09 Yes, possible to verbalize
BEFP09 The child was able to draw the places the animals live in. Details such as walkway were also included

AFTP10 All about wild animals

BEFP11 e.g. The hippo swimming e.g the bird eating the ...
BEFP11 Lion wants to chase another lion cos its cute

BEFP12 none seen in drawing
AFTP12 Giraffe, bat, lion, tiger
AFTP12 Understands the about giraffe mummy going to give birth. Bat is flying with butterfly (friend)

AFTP13 Able to label lion, giraffe, porcupine etc.

BEFP14 Understand that a leopard's baby is called a "cub" but spelt inaccurately
AFTP14 identify the animals as wild animals
AFTP14 Only label some of the animals

BEFP15 person shooting
AFTP15 Girl
AFTP15 Label people, place, animals
AFTP15 Naming a girl

2 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. Able to ***identify & label by naming the events related to the theme*** E.g. a birthday celebration, picnic

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Cobra climb up tree to eat orange
BEFP01 Tiger is very angry some people made the tiger angry
AFTP01 Associate 'turtle' doing an action –'lay eggs', 'lion' wants to 'eat' rhino

BEFP02 The koala bear is crawling
BEFP02 The drawing shows a rainy weather. Most of the animals are eating perhaps during rainy season the animal are hungry such as giraffe and lion
BEFP02 The drawing has a rain scene but not as in theme
BEFP02 Able to relate and describe animals' actions
BEFP02 The koala bear is crawling. The lion is eating. The snake is in the water

BEFP03 Giraffe eating the leaves
BEFP03 Able to identify wild animals
AFTP03 Daddy bear, mummy bear, cup; tree frog, girl
AFTP03 Tree frog
AFTP03 Baby rhino horn is longer & longer, father rhino horn is very long
AFTP03 Giraffe looking at bear, bear looking somewhere to buy food; hippo standing on rock, tree frog hopping, leaf drops into sea

BEFP04 The child is able to associate the animals with actions 'the parrot is singing song"; "The giraffe is eating the leaves"
BEFP04 Parrot is singing; giraffe is eating
AFTP04 Drawing of wild animals
AFTP04 The leopard is roaring, the rhino has sharp nose, gorilla is swinging on the tree, killer whale is jumping up & down
AFTP04 Gorilla swing, killer whale jumping in & out of water, leopard roars

BEFP06 Turtle lay eggs
BEFP06 Flying eagle
AFTP06 Identified the place where its taking place "Singapore zoo"
AFTP06 Theme is zoo and what's in the zoo
AFTP06 Singapore Zoo

BEFP07 Child drew the squirrel wanting to put the nut in the tree
BEFP07 Animals eating
BEFP07 e.g. Butterfly sucked the nectar in the flower and fly away
AFTP07 Lion talking to the butterfly, squirrel climbing the tree, rhino & panda finding food, bird is flying to the tree
AFTP07 Squirrel is 'climbing tree' to take the nut

BEFP08 Some what understand what are wild animals

BEFP09 Zoo map
BEFP09 Able to describe the giraffe eating leaves and what the kind cobra feels

BEFP10 Draw wild animals
AFTP10 All about animals in the wild

BEFP11 Animals interact with other animals e.g. need to climb tree to get food
BEFP11 Drew all kinds of animals

BEFP12 Animals finding food
BEFP12 Child created drawings around 'animals finding food'
AFTP12 Big tiger gives birth to baby tiger

AFTP13 Label things in the sky

BEFP14 Leopard drinking water, lion attacks rhino
BEFP14 There was no indication of any event related to theme
AFTP14 Missed out labelling giraffes and rhinoceros

BEFP15 Lion chasing the parrot, parrot attacks lion. Human shooting snake, Fly pokes eagle, Eagle eats fly
AFTP15 Rainforest
AFTP15 "rain in drawing to represent rainforest"

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

***Interpreting* by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material** *(see definitions below)*

a. *Able to* ***give examples by illustrating how things/objects function or associate*** *with something else related to the narrative/theme in their drawing .*
E.g. The police car and the ambulance always together when there is an accident.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 example: understand that the tiger is angry because people made it angry
BEFP01 The two eagles are flying above all other animals
AFTP01 Apples on the tree; bee hive; sun & cloud on the top

BEFP02 The giraffe is eating the leaf; the koala bear is crawling

BEFP02 illustrates giraffe is eating the leaf
AFTP02 Child able to verbalize of drawings well

BEFP03 Daddy rhino is behind the gate
BEFP03 Able to infer giraffe is a herbivores
AFTP03 Animals together means they are friends

BEFP04 Giraffe-leaves; Parrot-singing; Cub- sharp claws
AFTP04 Gorilla swinging from a tree; leopard is on the tree

BEFP06 Snake hangs on tree; Bat hanging upside down
BEFP06 Bat hanging upside down
AFTP06 Turtles lay eggs, monkeys can hang from trees & lions sleep too
AFTP06 Turtle lay eggs; monkey hanging on a tree

BEFP07 The tiger wants to eat the squirrel
BEFP07 Butterfly already sucked the nectar in the flower and fly away

BEFP08 Some knowledge that wild animals live near trees
BEFP08 The giraffe is besides a tree with apples
AFTP08 Bat flying in the sky and looking down on the animals

BEFP09 Knows that the king cobra gets angry and there's no meat
BEFP09 Giraffe eats leaves from trees, child draws arrows; snakes's home in a tree as indicated by yellow arrow
BEFP09 The giraffe is always near the tree as it eats the leaves
BEFP09 Able to associate pathways for walking in map
AFTP09 Apples on tree, snake on branch, pathways to every animals
AFTP09 Most of the animals are kept in an enclosed area
AFTP09 Child is able to describe the characteristics to animals – ie zebra and snake is a reptile etc.

BEFP10 A tree is drawn together with the lion while clouds are drawn in the sky where the eagle is flying
BEFP10 Related to the events
BEFP10 Eagle fly in the sky
BEFP10 Eagle in the sky; sky has clouds; see trees in the pictures
AFTP10 Both orang utan & monkey can swing so they are drawn on a tree
AFTP10 eagle & monkey above the ground; monkeys on the tree swinging; Bat wings spread out & wolf howling

BEFP11 Bat want to eat the leaves scare cross to the tree becos of eagle
BEFP11 Squirrel crawl up for nuts; birds eating apples
BEFP11 Same group of animals are together

BEFP11 Bat wants to eat the leaves scare to cross to the tree becos later eagle eat up the bat so he fly, fly

BEFP12 Yes animals finding food
BEFP12 'cancelled' patch because he spelt "giraffe" wrongly
BEFP12 the child drew a sun and trees which normally associates with outdoors
AFTP12 Bear on two legs – lion, tiger on four
AFTP12 Bat is flying with butterfly; enclosure is there to prevent tiger from eating the lion

BEFP13 The python are master seeing they all fight
BEFP13 The land animals are grounded, the bat can fly thus it is drawn higher with the moon & sun
BEFP13 The child is able to illustrate giraffe with what they eat
AFTP13 Bar are flying, sun is very hot; giraffe eating leaves; clouds in the sky
AFTP13 Land animals & flying creatures

BEFP14sun, flying cockatoo in the air; bat has flying motion; porcupine has quills; lion in attacking position; animals looking at each other has eye contact; cup for drinking water
BEFP14 Cobra looking at giraffe; lion attacking; Bat in the air; cockatoo fly
BEFP14 Able to understand that the lion is a predator and the rhino is a prey

AFTP14 Cage is for enclosing the animal
AFTP14 Baby giraffe stay with mother giraffe
AFTP14 Show them in enclosures; indicate the animals' diet

BEFP15 Getting hurt - plaster
BEFP15 Animal house
BEFP15 Birds fly in the sky
BEFP15 Gun for shooting, lion eating, parrot, so another parrot attacks. Plaster for injured; angry because of attack
AFTP15 Tree with apples
AFTP15 Tiger angry cos no food to eat
AFTP15 Apple & apple tree

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

b. Able to ***give examples by illustrating how people function or associate*** *with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital*

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01The king cobra crawling up the orange tree
AFTP01 Apple (colourful); lion has a smiling face; rhino angry (dark colours)

BEFP02 Not enough details as why the giraffe is eating

BEFP03 Mother giraffe haven't give birth yet
AFTP03 Tree frog hopping to the tree

BEFP06 Animals in cages

AFTP06 Apples were indicated 'cut off' to feed animals

BEFP08 child is able to understand some animals can ly, some animals stay on land

BEFP09 Pathway for people to walk

AFTP10 Iguana can climb tree, so can gorilla, orang utan & monkey thus they are drawn nearer to the eagle that can fly higher above ground
AFTP10 Monkeys swining; lion eats other animals

BEFP11 People sit on hippo & man near a hut
BEFP11 Person is next to the house

AFTP12 Trees & insect in zoo
AFTP12 Mummy giraffe has not given birth

BEFP13 Giraffe eat leaf

BEFP14 Lion wants to attack
BEFP14 Understand that the lion attacks its prey and how cockatoo flies
AFTP14 Giraffe has long neck; Rhino has horn

BEFP15 Gun -plaster
BEFP15 Human shoots the snake. Fighting
BEFP15 Animal – injury- people - gun
AFTP15 The girl is crying

1. ***UNDERSTAND*** *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

*c. Able to **give examples by illustrating how actions function or associate** with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Turtle is crawling
AFTP01 Rhino feels angry because the lion wanted to eat it

BEFP02 Able to relate that Koala bear is in an enclosure
AFTP02 Giraffe – smiling; Lion is crawling; Monkey is holding stone

BEFP03 Giraffe eating the leaves
AFTP03 Wind blow the leaves, a leaf drops into the sea

BEFP04 Eating; singing
AFTP04 Killer whale jumping out and down in the water

BEFP06 Turtle lay eggs; eagle flies
BEFP06 Snapping turtle is eating something
AFTP06 Only one mention that people can pick apple from an apple tree
AFTP06 Illustrations are very clearly drawn

BEFP07 Tortoise is crawling
BEFP08 Possibly that child relate giraffe as tall as the tree
BEFP08 Eagle & bat were drawn flying in the sky
AFTP08 Understand that when the bat flies its able to see the crocodiles, giraffe, standing on the hill is able to looking at all the animals

AFTP08 Bat is flying and looking down

BEFP09 Giraffe eating leaves on the tree due to its height
AFTP09 Python hangs on tree branch
AFTP09 The python is hanging on the tree branch

BEFP10 Bird is flying
BEFP10 animals on the ground, animals in the sky
AFTP10 Bat's wings spread out when flying; wolf's head upwards when howling; lion with angry face wanting to eat bat

BEFP11 Orang utan climb the tree
BEFP11 The lion wants to chase the tiger
BEFP11 People sit on hippo. Lion chase. Bee sting. Bat eat. Squirrel crawl; orang utan climb, bird eating
BEFP11 But leaves to cross the tree
AFTP11 The bat is flying on top of the lion to bump at it. The lion has a plaster because it got bumped by the bat
AFTP11 The lion leaps (outstretched limbs), rhino walk

BEFP12 Yes, spelt 'giraffe' wrongly so she/he cancelled the word
BEFP12 The child drew animals finding for food
AFTP12 Tiger wants to eat lion
AFTP12 leopard eats the butterfly; draw butterfly near the bat in the sky

BEFP13 Porcupine and lion are fighting
BEFP13 Giraffe are eating the leaf; Porcupine & lion are fighting; the python are watching all the fight
AFTP13 The child is able to describe an action "Lion is looking giraffe eating leaves"

BEFP14 Two animals talking; leopard drinking water

BEFP15 Fighting - plaster
BEFP15 Eagle swooping down; parrot hurt lion; fly poking eagle; eagle eating mosquito
BEFP15 Flying, hitting, catching, poke, eating
BEFP15 Parrot is angry because the lion wants to chase the parrot
AFTP15 Tiger is angry becos there is no food. Jump and eat an eagle
AFTP15 Tiger no food so jump and eat eagle
AFTP15 The tiger is angry (feeling of the tiger)

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

Classifying **by categorizing/subsuming things/events /people/objects according to functions/ placement etc.** *(see definitions below)*

d. Able to classify by ***organising/ categorizing things/objects*** **according to functions/ purposes/ placement** etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Group clouds, group birds
BEFP01 Classify land and flying animals and objects
BEFP01 Sun, bird, clouds are all sky level
BEFP01 Able to group all the yellow birds
AFTP01 Animal on the ground; the bats flying in the sky; apple/bee hive on the tree
AFTP01 Sky – clouds, sun, bat; grass – land animals
AFTP01 Child drew 'bat' in the sky, beehive on the tree; grass and trees drawn on lower level

BEFP02 The child is able to classify the animals on the ground; the clouds, rain and rainbow on the top of the picture, tree.
BEFP02 Rainbow (high level); animals (low level); Polar bear (high level)
BEFP02 Clouds upper level then followed by tree, last- animals such as snake, giraffe.
BEFP02 Giraffe and lion are all in the enclosure with Koala bears

BEFP02 Rainbow, clouds (higher level), animals, tree (lower level)
AFTP02 Cloud up in the sky & water can be seen right below
AFTP02 Frog, python, giraffe on lower level
AFTP02 sun, clouds, monkey hanging at higher level

BEFP03 Sun, bird, cloud are drawn at a higher level; grouping daddy & baby rhino in one area
BEFP03 Rhino in an enclosure; giraffe in another; sun & cloud on top
BEFP03 Group according to different animals
AFTP03 Sun above, birds in the sky; bears together, rhino together
AFTP03 Classify the frog on the pond, land animal, air animal and sea animal
AFTP03 Sun, birds, wind- higher level; water- lower level; bear family together – daddy & mummy bigger than cub

BEFP04 The child is bale to place the objects/animals appropriately e.g. clouds at the top
BEFP04 Bird sits on the tree, giraffe's height is the same as the tree
BEFP04 Giraffe, leaves, tree, parrot, lion, cub
AFTP04 Sun & wind in the sky; water at the bottom
AFTP04 Whale with water, gorilla swinging on the tree, leopard on the tree; wind & blowing
AFTP04 Group sky & land items/animals

BEFP06 Eagle flying in the sky, lion, tiger live in cage
BEFP06 Child drew clouds higher level. Sun is also drawn higher level. Trees lower level
BEFP06 Draw clouds at higher levels
BEFP06 Able to classify the animals separately even turtles/snapping turtle
AFTP06 Objects that are meant to be in the sky are on top. Tree is grounded. Animals separated in own cages
AFTP06 Boundaries and cages for each animal

BEFP07 Sky, clouds, plane, bird, sun, rainbow "family"; flower, grass – low level
BEFP07 The bird & aeroplane are in the sky; butterfly is placed in the middle to represent that it fly
BEFP07 Flower, tree, grass, cloud, sun, bird

BEFP07 Sun, clouds, rainbow (higher level); tree, grass, snake (lower-level)
AFTP07 Cloud & sun highest level, bird in the air, tree, flowers & animals on land
AFTP07 Sun/cloud in the sky; flower/tree – lower level
AFTP07 Creatures that fly and things up in the sky are drawn higher

BEFP08 some classification knowledge in the chid. Most animals have 4 legs
BEFP08 The eagle & bat are seen (at higher level) flying above the other land animals; the sun is at a higher level too
BEFP08 Grouping: Eagle & bat; tree & ground animals – lower ground
BEFP08 Creatures which fly are drawn higher, than the rest
BEFP08 Flying animals in air, land animals on ground level
AFTP08 The sun and clouds are on a high level and the hills are on the ground
AFTP08 Sun & bat, clouds (higher level) lion, crocodile, rhino (lower level); giraffe higher than lower level cos it is looking at the animals
AFTP08 Able to name the names

BEFP09 The animals all had a home of their own. Some were also behind fence
BEFP09 All animals in enclosure but a tree not needed
BEFP09 Clouds in the sky, animals on foreground are bigger; those on background smaller, cobras/giraffes placed together
AFTP09 Animals in their own enclosures clearly defined
AFTP09 Child drew same animals in the same enclosures ie. Giraffes, cobra

BEFP10 The eagle is drawn high-up in the sky while other animals like lion and wolf are on the ground
BEFP10 Able to organize animals that on land & air
BEFP10 Clouds & bird: ground & tree
AFTP10 Uses a top-down view in drawing
AFTP10 eagle + monkeys on trees; lion, rhino, wolf & cactus on ground

BEFP11 e.g. bats, orangutan
BEFP11 Bat, eagle, bee (higher level) , hippo, grass, pond (low level)
BEFP11 Eagle, bat fly, apples on tree. Grass and animals at ground level

BEFP11 Nuts on tree, eagles flying in sky
AFTP11 Bats being shown at a higher level, rhino, giraffe at a lower level
AFTP11 Sea water creatures in enclosures e.g crab in a rectangle pond and porcupine fish in 2 ponds, bats flying in the air

BEFP12 Similar "drawing" of sun and porcupine but sun is in the sky, porcupine on ground
BEFP12 Trees are seen at ground level and sun in the sky; bee in the sky
AFTP12 Grouping of clouds & sun in sky
AFTP12 Clouds, sun, bat, butterfly, rainbow in the sky; what's on the ground is on the ground

BEFP13 Land animal (lower level) bat, moon (higher level)
BEFP13 The land animals are lower while the bat which can fly is higher with the sky, sun & moon
AFTP13 Child is able to place the object animals accordingly e.g bats in the sky, tree on the ground
AFTP13 Higher level, sun, clouds, moon, bat
AFTP13 Able to distinguish bats fly and a giraffe eats leaves

BEFP14 Sun in the sky
BEFP14 Lion always attacks; birds fly
BEFP14 Sun (highest); flying cockatoo (in mid air) bat (flying)
BEFP14 Able to understand that sun is high up and giraffe is at the ground (lower)
AFTP14 Giraffes placed together, animals need fruits & water thus placed in each animals' territory
AFTP14 Tree stand alone by itself (plant)
AFTP14 Each species of animal is drawn in different enclosures

BEFP15 Sun- high in the sky; birds flying below clouds; lion on land; apples on tree; gun causing hurt; size of tree taller
BEFP15 Birds are higher than snake and lion. Clouds, sun at the top tree on the same level as snake/lion; parrots are in a group
BEFP15 Birds in the sky; sun & clouds above the birds. Trees, lion, snake on the lower level below the bird
AFTP15 Sun, clouds with rain (highest), tiger, tree pond (bottom part)
AFTP15 Categorise parrot, tiger, eagle

3 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

e. Able to classify by ***organising/categorizing events or experiences according to occasions / causes*** etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 The oranges on the tree

BEFP02 Its a rainy season. Cold region vs tropical region (polar bear vs giraffe, lion)
BEFP02 Drawing of animals
BEFP02 Able to draw things related to the theme

AFTP04 Wild animals

BEFP06 It could an experience in the zoo with wild animals
BEFP06 "Snapping turtle eating something" written says he recalls on outing
AFTP06 Write 'Singapore zoo'
AFTP06 Field trip to zoo; a sunny day

BEFP07 Drawing was theme-based
AFTP07 Three suns to represent very hot desert

BEFP08 Some evidence that showed the child knows few animals can fly

AFTP09 Cheetah, giraffes, cobra, python, coral snake

BEFP10 In the forest
BEFP10 Land animals: sky animals

AFTP10 Rhino sees the cage – zoo?

BEFP11 Drew all kinds of animals
BEFP11 People sits on hippo; plaster on eagles

BEFP12 Yes, drew more of the land animals
BEFP12 Outdoor with animals, tree and sun
BEFP12 The child kept to the theme of wild animals and drew animals with the environment
AFTP12 Sun, clouds are on higher level; tree at lower level, bat & butterfly are at high level

AFTP13 Wild animals are outdoor in the nature

BEFP14 When thirsty drink water +cup
AFTP14 Animals meal time

BEFP15 Blood, injured so there's plaster. Parrot got attack so another hits back snake is vicious so got to use gun. Angry because friend got attacked
AFTP15 Rainforest: raining

4 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

f. Able to classify by ***organising/categorizing people according to functions/gender/relationships/occupation/ placement*** etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Able to categorise all wild animals, lion, tiger & zebra
AFTP01 Rhino feels angry (dark colour) sun is orange, grass is green

BEFP02 The tree is taller than lion & giraffe

BEFP02 Sizes not proportionate e.g. giraffe and koala bear the same size
BEFP02 Tree is taller than the animals

AFTP03 Daddy bear is bigger and drew taller than the mummy bear; 'cup' (baby bear) is small; 7 years old tree is taller than 6 years old tree
AFTP03 Able to group animals in their family and close to each other, daddy and mummy is taller than child, baby rhino horn is growing, father rhino horn is very long

BEFP06 Drew the eggs outside the water
AFTP06 People cut off the apples from the tree

BEFP08 Little knowledge of creepy wild animals
BEFP08 Classify: land animals; animals that can fly

BEFP09 The giraffe is portrayed as the tallest in the picture just like in a zoo

AFTP10 New born eagle with mother eagle on the tree; monkeys swinging on the trees; fierce animals are bigger & caged

BEFP11 Group same type of animals together

BEFP12 Yes, butterfly flies higher. Sun is 'high' in the sky
BEFP12 Grouping tigers & lions together. Different sizes but did not indicate adult/child

BEFP14 Porcupine- ground level; lion/tiger – mid ground; Bat high level
AFTP14 Baby giraffe is smaller than the other giraffe
AFTP14 Mother giraffe is taller than baby giraffe

BEFP15 Eagles together highest in the sky; parrots together lower than the eagles; people together below on land
BEFP15 Girls with longer hair and skirt carries a basket
AFTP15 Smiling girl holding onto crying girl

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**
Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*	
g. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of things/objects*** in their drawing. E.g. the little boy threw the ball so the window broke.	

Respondents' supporting evidence

Drawing	**Descriptions**
BEFP01	*Tiger is angry cause some people made it angry*
AFTP01	*Rhino feels angry; lion feels happy*
AFTP01	*Rhino is angry because…*
AFTP01	*Child explains that the rhino is angry as the lion wants to eat it*
BEFP02	*No further explanation of the animal's actions*
AFTP02	*Cover the giraffe's legs because bare long legs*
BEFP03	*There is only one giraffe because the mother giraffe have not given birth to a baby*
AFTP03	*The wind blow and the leaf fall into the sea*
AFTP03	*The wind is stronger blowing the leaves and the leaf drop into the sea*
AFTP03	*The wind blowing leaves – leaf drops into the sea*
BEFP04	*Compares lion's sharp nails & teeth with the cub's sharp claws. Bird is angry*
AFTP04	*Eagle is eating the leaf with his sharp teeth*
AFTP04	*Four-eyed frog can scare the other animal away. The eagle has sharp beak*
AFTP04	*Four-eyed frog can scare animals away*
BEFP06	*Drew the eggs outside the water*

BEFP06 Laocoon is sleeping because he/she is tired
BEFP06 Inferring and conclude tiger is tired
AFTP06 A red line drawn across some apples on the tree to signify that they've been picked
AFTP06 Apples to feed animals

BEFP07 Squirrel, tiger, butterfly, bird – tells what they want to do
BEFP07 The squirrel wants to take the nuts & put inside the tree trunk – indicate the knowledge of squirrel's habitat
BEFP07 Butterfly already suck the nectar in the flower and fly away
BEFP07 The squirrel found a nut and wants to put it in the tree trunk
AFTP07 Explained what the different animals are in the drawing

BEFP08 Little knowledge of how causal effect of objects in the drawing
BEFP08 Giraffe is drew as the tallest; snake as longest; porcupine as the smallest animal on land; in the sky the bat is drawn smaller than the eagle; comparing to eagle & bat the sun is drawn at a highest level, showing the order of sequence
AFTP08 Lion is looking for food; crocodile is looking at the rhinoceros; rhino looking at giraffe
AFTP07 Squirrel climbing the tree to take the nut

BEFP09 The king cobra wants to eat meat because it is angry
BEFP09 The king cobra angry because it wants to do ...something

BEFP11 e.g. bee sting so eagle got plaster
BEFP10 Land-tree; lion-turtle; sky-cloud-eagle
AFTP10 The iguana is very angry because the iguana is hungry
AFTP10 Iguana is very angry because it is hungry
AFTP10 Bat flying to cactus when lion wants to eat it; mother eagle stays with baby eagle & feeds it with things

BEFP11 Bee sting eagle so got plaster
BEFP11 Bee sting eagle so has plaster. Squirrel crawl up tree to eat nuts

BEFP11 Bee sting and you need a plaster
AFTP11 The lion got a plaster on its face because the bats wants to fly on top to bump the lion
AFTP11 Bat wants to bump the lion so child drew the plaster?

BEFP12 Yes, covered up the word that he/she wrote wrongly
AFTP12 Tiger is going to eat lion but the gate prevent tiger eat lion
AFTP12 The gate prevents the tiger from eating the lion

BEFP13 The python are master seeing they all fight
BEFP13 The giraffe eats the leaf on the tree, the porcupine & lion are fighting & the python looks on as it master
AFTP13 Conclude that clouds in the sky

BEFP14 water/cup when thirsty
AFTP14 Bat is angry because he cannot get out of the bat cage

BEFP15 Plaster on bird, eagle, snake due to injury; Eagle swooping down; people shoot so caused injury
BEFP15 Parrot is angry because the lion wants to chase the parrot using steel to hit the lion
BEFP15 Birds are with plaster because the fly doke poked them; gun shot snake so the snake ahs a plaster
AFTP15 Girl is crying because there are no apples
AFTP15 e.g. The tiger is very angry' 'The girl cry'

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

h. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of <u>events</u>*** in their drawing._____ E.g. the two children quarrelled because they refused to share the toy.

<u>Respondents' supporting evidence</u>

<u>Drawing</u> **<u>Descriptions</u>**

BEFP01 Able to give reason why the tiger is angry also able to tell the reason why the snake slide up to the tree
AFTP01 Rhino & lion; bats flying together

BEFP02 There are eating because they are hungry since its raining heavily
BEFP02 No further explanation

AFTP03 Daddy giraffe neck is very tall looking at the bear

BEFP06 Snapping turtle is eating as he/she is hungry
AFTP06 A sunny day monkey is hanging on a tree. A lion in a cage – environmental awareness

BEFP07 The butterfly got its nectar so it flew away from flower

BEFP08 Outdoor, wild animals
BEFP08 Only the evidence seen with drawing Giraffe facing tree

BEFP09 The snake is angry because of something
BEFP09 The king cobra is angry as it wants to eat meat

AFTP10 Lion is looking at the bat because it wants to eat it

BEFP11 This lion wants to chase this lion because this lion loves this lion becos is cute
BEFP11 Bat wants to eat leaves scare to cross to tree becos later eagle eat the bat
BEFP11 Bat scare to cross the eagle

AFTP12 Tiger wanted to eat the lion but the gate prevent it; Bat is flying with butterfly because they are friends

AFTP14 The bat is angry because it cannot get out of the cage

BEFP15 Snake wants to catch the lion's tail; lion wants to chase parrot; gun shooting
BEFP15 Parrot is angry. Girl shoots snake. Gun shot, plaster
AFTP15 Tiger is angry because there is no food. Jump and eat an eagle
AFTP15 "Because there is no food to eat"

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

i. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of <u>people</u>*** in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car

<u>Respondents' supporting evidence</u>

<u>Drawing</u> **<u>Descriptions</u>**

BEFP01 Tiger is angry, the child draws smoke and colour red above the tiger
AFTP01 Rhino & lion

AFTP03 The birds stay together in the sky because they are friends

BEFP06 Conclude and have conceptual knowledge "lion is danger and caged"

BEFP09 People need a pathway to move around the zoo

AFTP10 Fierce animals caged

AFTP12 Bat is flying with butterfly because they are friends

BEFP15 Two girls are fighting
BEFP15 Two girls are fighting

AFTP15 Girl is crying because there are no apples

3 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*

a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why things/objects*** are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 The snake went up the tree to eat oranges
AFTP01 Turtle lay eggs; plants need sunlight
AFTP01 Turtle lay eggs

BEFP02 The giraffe is eating the leaf
BEFP02 Able to identify location of snake and polar bear
AFTP02 Monkey seen climbing, holding stone
AFTP02 The stone tree is protruding outward; so monkey could be hanging

BEFP03 The gate for giraffe

AFTP03 Hypo need to have a habitat to be happy, so he is very happy standing on the rock

BEFP04 The tree. The giraffe is eating the leaves for food
AFTP04 Eagle has sharp teeth- can eat the leaf; rhino has sharp nose
AFTP04 There must be water for the killer whale to spit out

BEFP06 Turtle lay eggs turtle comes from eggs
BEFP06 Eagle is flying because it has wings
BEFP06 Inferring eagle can fly (directions) high level

BEFP07 Butterfly to suck nectar from flower; squirrel took nut from tree
BEFP07 Butterfly-nectar from flower; squirrel take nut & put in tree
AFTP07 Drew a speech bubble near the lion to indicate conversation with butterfly; drew a patch to indicate butterfly leaving from flower; Rhino & panda want to find food.
(2 animals are shown to be walking)

BEFP08 Some procedural understanding by the child's drawing from bigger animal to smaller ones
BEFP08 The apples turned from green to red on the apple tree, thus relating a ripening process identified

BEFP09 Every animal enclosure had a pathway leading to it!
BEFP09 Pathway is for walking, animals are in enclosure
AFTP09 Python is hanging on the tree branch

BEFP10 Drawing a Forest
BEFP10 Bird-sky-cloud; land-tree-turtle, king cobra, lion, wolf
AFTP10 Eagle catch a twig to make a nest
AFTP10 Bat near cactus; so lion will avoid being pricked

BEFP11 Plaster on eagle because stung by bee
BEFP11 Bee sting so wear plaster
AFTP11 The porcupine fish are being drawn in a blue circle. The colour blue means water
AFTP11 Bats on top because they fly; rhino walk straight line

AFTP12 Child knows that mammals is reproduced by having babies

BEFP13 the porcupine &b lion could fight with each other as they are with on the ground, the python looks on as it is master

BEFP14 Sun shining, Bat in air
AFTP14 Giraffe neck is long so therefore he ran see the rhino
AFTP14 Bats love to eat fruits, so there are many fruits in the cage. Giraffe love seeing the rhino thus the rhino was placed in giraffe's eye view

BEFP15 Plaster to cure; house for shelter; tree for outdoor; sun & clouds (sky)
BEFP15 Lion chase, parrot hits lion; parrot is angry; snake got shot, there's a plaster
AFTP15 Eagle above tiger so that it can jump and eat the eagle

4 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why people come from and where they go.*** E.g. mummy comes from the office to pick me up from school and we are going home now.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP02 Rain comes from clouds

BEFP03 Infer that mama giraffe is pregnant
AFTP03 The frog is a tree frog so it is hopping to the tree

AFTP04 Various wild animals

BEFP06 King cobra is hanging on the tree as its body is very flexible
AFTP06 Knows that turtles lay eggs, new baby turtles are from eggs

AFTP09 Pathway

AFTP10 Mother eagle and baby eagle
AFTP11 Fish lives in water

BEFP12 Yes,the animals are facing the left directions

5 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why events happen and its outcome***. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 King cobra near the orange tree wants to eat orange

BEFP02 When its raining, maybe the child is trying to say that the animals were hungry
BEFP02 Big clouds and heavy downpour
BEFP02 Can see the rainbow after it rained
BEFP02 Apple on a tree
AFTP03 Baby rhino's horn growing, father rhino's horn long; older tree (7 yrs old) is bigger
AFTP03 When the wind is strong the leaves will move

BEFP04 Leaves are food for giraffe

BEFP06 Sun is smiling so no rain
AFTP06 Sunny day in the zoo; so lion is sleeping and monkey is playful
AFTP06 Lion is sleeping with the eye closed

BEFP07 When there is sun there are clear clouds and rainbows
BEFP07 Baby bird is crying for food
BEFP08 The child drew a sun in evidence that all living things need light
BEFP08 There's bright sun and the tree grew strong and photosynthesis seems to take place making the green apples turned red
BEFP08 Wild animals in the open under the sun

BEFP09 Elaborated that the zebra has stripes on its body
BEFP10 cloud-bird-sky

BEFP11 Squirrel crawl up the tree then eat the nuts

BEFP12 Yes, trees are important to the animals
BEFP12 The animals are finding for food in sunny weather

BEFP15 Sunny day – sun & clouds & animals flying : outdoor
BEFP15 Snake got shot and has a plaster
AFTP15 Raining – pond with water

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*

a. ***Differentiating people/events/ things/objects by distinguishing / selecting relevant from irrelevant parts*** or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Differentiate birds & wild animals
BEFP01 Oranges grow from orange tree
AFTP01 Rhino & lion are wild animals; grass & tree; sun & cloud
AFTP01 Child drew apples on the tree, beehive on tree

BEFP02 The polar bear is drawn separated from the rest of the animals; cold region and tropical region
BEFP02 Spots on the giraffe; lion head
BEFP02 Clouds/rain, tree/apple
BEFP02 Able to draw snake in a coiling position and giraffe with spots
BEFP02 Able to differentiate things belonging to sky & land
AFTP02 Frog is seen near water
AFTP02 Everything is under wild animals

BEFP03 Able to classify things in the sky and those on the ground
BEFP03 Draw animals related to zoo
AFTP03 The land animal will only stay on the land and sea; animals in the sea. Animals stay in their habitats
AFTP03 Rhino's horn, tree's leaf

BEFP04 Parrot sits on the tree, cub & lion are on land

BEFP04 The lion has sharp nail and sharp teeth already etc..
AFTP04 Rhino has sharp nose. Monster looks scary. Whale lives in the sea

BEFP06 Turtle lay eggs. Not the lion or tiger

BEFP07 Squirrel takes the nut
BEFP07 Birds and squirrel live on trees child able to know land animals
AFTP07 Nut and cherry grow on the tree; birds & butterfly fly

BEFP08 Able to differentiate objects that are on air or on land
BEFP08 Porcupine – quills, giraffe-spots; apple-tree
BEFP08 The child is able to draw apples on trees
AFTP08 The bat is above and the animals are at the bottom

BEFP09 The different enclosure; there's pathway too;
BEFP09 Identifying things in the zoo, zebra have stripes, leopard & jaguar have spots
BEFP09 Able to classify that giraffe has long neck and snake is coiled
AFTP09 Snake kept in cages; apples on tree
AFTP09 Child grouped the herbivores and carnivores into separate enclosures

BEFP10 On land vs animals; animals in the sky
AFTP10 Able to draw tree & cactus which can be found in the wild
AFTP10 Animals & cactus on the ground & birds on the trees

BEFP11 Differentiate things & animals on land & those that fly
BEFP11 Tiger snake has stripes

BEFP12 Yes, associate animals with trees in the forest
BEFP12 Child knows which are land animals and sky creatures
AFTP12 The lion has a mane; the giraffe has a long neck; the different between bat and butterfly (antenna); rainbow has different colours

BEFP13 Tree is grown from the ground which is why it is drawn together with the land animals
AFTP13 Differentiate things on the ground & in the sky
AFTP13 Land creatures and creatures in the air

BEFP14 Animals that fly are higher
BEFP14 Child can differentiate which animals are on land/air
BEFP14 Lion wants to attack the Indian Rhino
AFTP14 Baby giraffe stay with mother giraffe

BEFP15 Drawing a curved beak for the parrots. Round wings with zig-zag tails for eagles
BEFP15 Apples in a tree, handbags for a girl
AFTP15 Apples on tree

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. ***Organizing people/events/ things/objects by finding coherence / structuring how elements fit or function*** within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.

Respondents' supporting evidence

Drawing **Descriptions**

AFTP01 Animals & trees
AFTP01 The animals are all outdoor, child drew trees, grass, clouds etc.

BEFP01 Group the crawling cobra & turtle next to the tree

BEFP02 Animals
BEFP02 Able to relate that animals are exposed to the rain except for polar bear
BEFP02 Able to differentiate things belonging to sky & land

BEFP02 After the rain has stopped there is a rainbow

BEFP03 Giraffe is eating the leaves
AFTP03 All the animals the child drew are wild animals
AFTP03 In the wild: trees, sea, rhino, hippo, tree frog, bear, giraffe, birds

BEFP04 Able to draw animals & how they might behave in the wild
BEFP04 Sentence structures and name the items
AFTP04 Leopard climb on tree, whale jumping out and down in water

BEFP06 Eagle has wings, lion has mane
AFTP06 Knows animals are part of a zoo. That they need shelter in their enclosure

BEFP07 Trees, animals, flowers, grass
BEFP07 Wild animals: grass, trees, wild animals
AFTP07 Animals are outdoor with clouds, sun, trees, However child drew 3 suns
AFTP07 Drew parts of the tree (e.g. nut, fruit, bark) ; Clouds/suns

BEFP08 few evidence int he drawing that child organized the snake talking to the porcupine
BEFP08 Sun is in the sky; wild animals are in the open
AFTP08 Organize animals according to land & sky (where they belong)

BEFP09 The child included all the relevant things in the zoo
BEFP09 The animals have their own designated places
BEFP09 Organizing animals in their enclosure with pathways
BEFP09 Animals in enclosures, giraffe near the tree (giraffe eat leaves)
AFTP09 Pathway, cage, trees

BEFP10 The animals are organised into those that are on the ground and those that can fly
BEFP10 Animals are positioned differently-enclosure

BEFP10 Bird-sky-cloud; land-tree- pond
AFTP10 Iguana – high up on top; monkey & gorilla on trees; cactus – low on the ground

BEFP11 Able to show these animals relate
BEFP11 Good concept of spatial awareness e.g. eagles fly; orang-utan climbs tree

BEFP12 Yes, associate animals with trees in the forest
BEFP12 Sun and trees are found outdoors
AFTP12 Wild animals found in a zoo

BEFP13 The child is able to organize the animals, sun and moon in the outdoor scene
AFTP13 Tree organized together with the giraffe

BEFP14 Animals drawn are wild animals
BEFP14 Child understands that animals live outdoor and look for food & water
BEFP14 Some animals were not in the list

BEFP15 Outdoor: so there is drawing of trees
BEFP15 Outdoor setting with trees, lion, snake, houses, sun, clouds

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. ***Attributing people/events/ things/objects by deconstructing to determine a point of view, bias, values, or intent*** **underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Angry tiger because some people made it angry
AFTP01 Rhino angry with lion; witch turned it to a duck

AFTP01 Child explained that rhino is angry as the lion wants to eat it

BEFP02 Able to label the snake as Tom Yam snake

AFTP03 Mummy is a family member that provide food to the child and like to wear accessories
AFTP03 Hippo is happy, standing on rock

AFTP04 Wind blowing on the leopard
AFTP04 The wind is blowing the leopard so the leopard roar & the child drew a 'big roar' coming from the leopard

BEFP06 Organize by putting all the animals in a cage except the bird (eagle)
BEFP06 Animals live in cage, eagle; fly in the sky
AFTP06 e.g Turtle lays eggs

AFTP07 Three suns to indicate the extreme heat of a desert

BEFP08 Eagle & bat have wings and fly in the sky

BEFP09 Spatial perspective/depth drew animals in background smaller-leopard, jaguar is giraffe larger in foreground
AFTP09 The cheetah wants to eat the other animals

AFTP10 The wolf is howling as it is trapped; a cage & need help to escape
AFTP10 Iguana – angry; wolf-calling by howling; lion-fierce

BEFP11 e.g. lion is cute
BEFP11 Eagle got plaster becos stung by bees

BEFP12 The animals are wake and appear to be walking to find food

BEFP14 Lion wants to attack

BEFP15 Parrot is angry because lion wants to chase the parrot
BEFP15 Animals get a plaster because they are hurt
AFTP15 Tiger & girl

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*

a. ***Checking by drawing to determine things*** e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Lion smiling, showing happy

BEFP02 The raining has caused the animals to feel hungry and they were eating

BEFP03 "Baby rhino nose very small one. The baby rhino horn is growing"
AFTP03 An older tree has more roots; the sun is very hot providing a vibrant environment in the drawing
AFTP03 Wind blows strong, leaf drops into sea

BEFP06 Eagle is not in a cage as it needs to fly

BEFP07 Baby bird crying for mummy

BEFP08 Eagle looking down on the snake

AFTP10 Iguana angry

BEFP11 Eagle got plaster – the bee sting got bee hive
BEFP11 Bat wants to eat leaves, scare to cross because later eagle eat the bat
BEFP11 Bee sting so need plaster
AFTP11 The lion got a plaster on its face because the bats bumped the lion

BEFP12 The animals are all looking for food
BEFP12 Yes, animals need to find food on their own

AFTP14 bat angry because he can't get out of these places – bat cage

BEFP15 Parrot is angry because lion wants to chase the parrot
AFTP15 Girl crying as there are no apples. Tiger angry because of no food

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

b. ***Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing)*** of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 The tiger is angry with a red top on his head
AFTP01 Bats come out during day time
AFTP01 Child drew a duck and explained that a witch turned it into a duck

BEFP02 There is a tom yam snake drawn by child. It was red in colour. Perhaps, the child knows that tom yam is spicy & red.
BEFP02 Koala bear has button on its body
BEFP02 Naming the snake Tom Yam snake
AFTP02 Giraffe is smiling & cover the leg

BEFP03 Bear wore a necklace
BEFP03 The baby rhino horn is growing

BEFP04 The parrot is singing a song. The giraffe is eating leaves; then lion has sharp claws & nails; the cub has sharp claws
AFTP04 Stick man riding on rhino
AFTP04 Gilla monster has very sharp nails; Gorilla is swinging n the tree with arm hanging on to the tree

BEFP06 The bat hangs upside down. Turtle lay eggs
BEFP06 Sun has a happy face. Drew Bat as black and text word 'Bat" in black ink too
AFTP06 Apple strike off, showing apples cut off by people

BEFP07 There are 3 rainbows in the sky instead of 1
BEFP07 Rainbow has eyes, nose and mouth
BEFP07 rainbow have eyes, noses and mouth
AFTP07 Child drew cloud & rainbow with face expressions

BEFP08 Bat's laughing
BEFP08 The child drew smiling face on the snake, giraffe, bat & sun

BEFP09 The jaguar is green in colour

BEFP11 Eagle has plaster
BEFP11 Plasters on all eagles
AFTP11 Plaster on lion; bat sit on mandrill

BEFP12 The drawing appear to be appropriate
BEFP14 Giraffe with long neck position of lion attacking double horns of rhino

BEFP15 Drawing eagle with a plaster
BEFP15 Eagles have plaster. Snake has plaster. Parrot holds steel. Fly pokes eagle
BEFP15 Plasters on birds indicating that they are hurt; Parrot holding onto steel to hurt the lion
AFTP15 Baby parrot eating diaper. Eagles with plasters
AFTP15 The baby parrot eat the diaper

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*

a. ***Generate by coming up with alternative hypotheses based on criteria to account*** for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Tiger is very angry because some people made it angry
AFTP01 Rhino angry with lion
AFTP01 Rhino is angry as lion wants to eat it

BEFP02 The animals are hungry because it was raining

AFTP03 Mummy bear has a heart shaped necklace
AFTP03 Daddy bear looking for food, tree frog hopping to tree; giraffe looking at bear
BEFP06 The eagle has red eyes

BEFP06 "Tiger is tired" he analyse tiger sleeping

BEFP07 Butterfly flying away because nectar was taken from flower

BEFP08 Not much can be showed

BEFP09 The King cobra is angry; it wants to eat meat

AFTP10 Iguana is hungry, gorilla is very thirsty
AFTP10 Hungry -- angry; calling – head upright

BEFP11 This lion wants to chase this lion because this lion loves this lion becos is cute
BEFP11 Lion wants to chase lion because lion loves the lion
AFTP11 The rhino wants to scare the porcupine fish because it wants to eat the plants
AFTP11 Bat wants to fly on top to bump the lion

AFTP14 Bat angry because he can't get out of these places – bat cage

BEFP15 Parrot is angry; eagle flying down
BEFP15 Parrot is angry because lion wants to chase the parrot
AFTP15 Girl crying as there are no apples

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. ***Plan by designing a procedure to accomplish a task in drawing*** e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.

Respondents' supporting evidence

Drawing **Descriptions**

BEFP02 Drew buttons on Koala bear and rainbow in rainy day

BEFP03 Design a gate for each group of animals
AFTP03 Colour scheme are well-matched in the drawing
AFTP03 Bears have necklaces

BEFP06 Snake twines on a branch

BEFP08 Cannot inferred from the drawings to create wild animals theme

BEFP09 Draws a pathway that is accessible to see all animals
BEFP09 Road map of the zoo from animal to animal
BEFP09 Able to indicate a gate at the pathway to the enclosure of the animals
AFTP09 Design pathway to each animal

BEFP10 There is a short pathway from the wolf to the animal on the left
BEFP10 Able to plan different kind of animals

BEFP14 water cup, lion's mane, bat with wings (lines on sides)

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. ***Produce by constructing or inventing in drawing a model or product*** e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-

Respondents' supporting evidence

Drawing **Descriptions**

BEFP01 Poker dot of black circles on giraffe's body
AFTP01 Witch turned it to a duck (4 feet)
AFTP01 Witch turned it into duck

BEFP02 Tom yam snake
BEFP02 Tom Yam snake has a spiral body because in water
BEFP02 Able to create his own snake species
AFTP02 Stone tree besides a real tree

AFTP03 The birds fly together in a circle formation, different from flock formation

BEFP04 Singing parrot
AFTP04 Drawn wind sign to show wind is blowing

BEFP06 Snapping turtle invent a turtle with spikes
AFTP06 Colourful and attractive colours used

BEFP07 Rainbow with faces - personification
BEFP07 The rainbow has a face
BEFP07 Rainbow has eyes, nose & mouth
BEFP07 Rainbow have eyes, noses, and mouths

AFTP07 Created 3 suns to show heat of the desert & a rainbow smiling face
AFTP07 Rainbow, clouds with smiling faces

BEFP08 More flying animals could be included in the drawings

AFTP10 Birth eagle; the lion likes to eat the bat

BEFP11 green lines for grass
BEFP11 Tiger rhino snake; Tiger-snake
BEFP11 Tiger snake, tiger rhino snake
BEFP11 A hut and a man
AFTP11 Porcupine fish – fish with spines

BEFP14 standing snake, porcupine
BEFP14 Bat with two lines at sides both to show that it's flying

BEFP15 Animal house
AFTP15 Lines to show butterfly is shining

REMARKS: BEFP12 The *child likes tigers especially. When there is no space to write 'e' for 'snake' he wrote it on top of 'snak' and didn't want to cover the face of the tiger*

1 REMEMBER *Please rate the drawing in a scale of* ***1 (Least Evidence) to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**
Recognizing/ Recalling/Retrieving by Identifying & labelling things/ events/ people/objects *(see definitions below)*	
a. Able to ***identify & label the names of things/objects related to the theme***. E.g. a house, a tree, a bird etc	

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01 Child able to identify and label rainbow, black cloud, rain, star cruise, levels of deck, and 6 colours in rainbow
BEFTM01 House, rainbow, cloud, rain
BEFTM01 Star cruise – ship; ship on wter (sea); black cloud- rain; rainbow happens after rain
AFTTM01 Mermaid, waterfall and rain are well-related to the theme
AFTTM01 Most of the drawings are labelled
AFTTM01 Waterfall, cloud, rain

BEFTM02 Identify the sea water
BEFTM02 The people to sliding down to sea water
AFTTM02 Ladder, boat, cloud, rain, flag, floor, sand, water
AFTTM02 Child able to identify the object that he/she has drawn
AFTTM02 Objects like clouds, ladder, sand etc are labelled and identified

BEFTM03 identify the fish,, man, water
BEFTM03 Able to label everything in the drawing: river, man fish
BEFTM03 Child draws water in blue colour flowing in random pattern like water cycle
AFTTM03 There are different types flavours of water. Water comes in different temperature
AFTTM03 The child is able to label the colours. And also relate it to flavours

BEFTM04 Toilet bow, sink
BEFTM04 Water found in toilet bowl and sink – labelling of flush, cold & hot water
BEFTM04 The child is able to identify the different objects in relation to the theme

BEFTM04 The toilet bowl has flush and the sink has taps
AFTTM04 Only able to link unnamed person to picture
AFTTM04 Able to associate that water can be in mountain, from fountain

BEFTM05 Minimum link to lesson object e.g. river, water, fountain
BEFTM05 Able to identify that he/she is in danger, thus asking for help
BEFTM05 Able to identify river, water fountain
BEFTM05 Know that water come from the river. Associate swimming in water fountain
AFTTM05 ocean people swimming, animal
AFTTM05 People, hot, cold, warm, water, ocean, duck
BEFTM06 The sky getting darker and darker; raindrops came from cloud
BEFTM06 Is able to draw clouds and talk about thunder. And from the clouds, it provides water to the swimming pool
BEFTM06 Able to identify and label the swimming pool, thunder, rain and dark clouds
AFTTM06 Toilet bowl, flushing button
AFTTM06 The child is able to label toilet bowl, flushing buttons and where the water is
AFTTM06 She mentioned toilet bowl of washing button, the backside was not wiped, her friend, baby, my friend
AFTTM06 Toilet bowl, flushing button, motion

BEFTM07 Bath tub, shower, tears
BEFTM07 Child drew showering, bath tub and a child crying (tears)
BEFTM07 No labelling (verbal but not writing)
AFTTM07 Able to label 'poo poo', 'toilet bowl' 'water comes' out, 'splash'
AFTTM07 Able to identify the toilet bowl & the poo poo
AFTTM07 Child was able to identify the squatting toilet bowl and sitting toilet bowl

BEFTM08 Labelling of animals, objects
BEFTM08 River, shower, drain, able to show that water from the river goes to human daily usage then into the drain
BEFTM08 Shower area, river, water, rainbow in sky, bridge
AFTTM08 Named 'shower', 'pipes'
AFTTM08 "Shower" "pipe to.." "..a bath in the bathtub"

BEFTM09 Water comes from the sea
BEFTM09 Fish, house, rainbow, sea water, sun
BEFTM09 Able to label & identify 'sun', 'rainbow', 'house', 'sea', 'fish'
BEFTM09 Rainwater, fishes in sea
AFTTM09 child drew lines to represent river & sea (part of water cycle)
AFTTM09 Child labelled the river, castle, sea, applied orange
AFTTM09 The child is able to label rain

BEFTM10 Drain, ocean, whale, dolphin, rainbow, rain, drain
BEFTM10 Mermaids, whale, dolphin; rain &b cloud
BEFTM10 Ocean, star cruise, mermaid
AFTTM10 Able to associate water with drain, vocab knowledge quite wide by saying ocean know rain create or contribute to making ocean
AFTTM10 Starcruise, mermaid, dolphin, whale, rainbow, drain
AFTTM10 Rain, water goes into the drain, ocean water
BEFTM11 Clouds, lightning, rain, sea water
BEFTM11 Rain cloud + lightning + rain + earth & sea
BEFTM11 Able to identify and categorize cloud, rain and lightning together. Both rain & sea water related to water
AFTTM11 Toilet, sink, pipe, water
AFTTM11 Sink, toilet, pipe
AFTTM11 Can label all the relevant objects

a. Able to ***identify & label the names of people related to the theme*** E.g.. this is mummy, daddy, baby etc.

Respondents' supporting evidence

Drawing **Descriptions**

AFTTM01 The mermaids has no relation to one another
AFTTM01 Able to identify not label
AFTTM01 Mermaid
BEFTM02 Sea water, people

AFTTM02 label "they"
AFTTM02 "they sit the boat"
AFTTM02 Can see a person sitting on the boat

BEFTM03 Identify man
BEFTM03 Identify the man, fish mentioned Einstein
BEFTM03 Man
BEFTM03 Fish swims in water and man does not

BEFTM04 Toilet bowl, sink, flush, hot/cold water
BEFTM04 Able to associate where water comes from and where it is going
AFTTM04 one person trapped; one person trying/going to save
AFTTM04 Water theme – yes a link
AFTTM04 Fountain, water, mountain

BEFTM05 No people associated with water cycle (dhild had drawn a person)
AFTTM05 Swimming e.g. duck
AFTTM05 Duck, people

BEFTM06 mummy feeling cold
BEFTM06 Able to identify mummy, ladder, swimming pool, thunder
BEFTM06 identify herself and mother
AFTTM06 The child, friend, pass motion in toilet
AFTTM06 Able to identify and label baby & friend
AFTTM06 Baby, my friend

BEFTM07 Able to identify but no labelling
AFTTM07 Process of poo and where it goes
AFTTM07 Child did not specify which one was the daddy, mummy. He used the term 'they'
BEFTM08 Only label the human beings

BEFTM08 Turtle, fish, individuals taking shower in a room
AFTTM08 e.g. 'someone taking a bath in the bathtub'
AFTTM08 Generic labelling "someone"

AFTTM09 The child is able to associate princess with the castle

BEFTM10 Mermaid
BEFTM10 By size
BEFTM10 Mermaids
AFTTM10 Associate fairy tales into real life (mermaid) know ocean have dolphin & whale

BEFTM11 No people drawn
AFTTM11 Girl / Boy
AFTTM11 Can label and differentiate Girl toilet and Boy toilet

b. Able to ***identify & label by naming the events related to the theme*** E.g. a birthday celebration, picnic

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01 Able to identify and label by drawing the cruise ship to associate it with water cycle
BEFTM01 Name the event is with the star cruise recall that had happened
AFTTM01 A mixture of drawings

AFTTM02 No clear indication of the water cycle theme

BEFTM03 Identify the water as big waves
BEFTM03 The child is able to understand water forces can be very powerful which can wash the man away. Water flows and fish swims in water
AFTTM03 probably the child understands that all our water comes from the sea (water cycle)

AFTTM03 The flavour sea come from the rain
BEFTM04 Toilet bowl, sink,
BEFTM04 Perception of how water comes from and where is going
AFTTM04 Adventure/ holiday
AFTTM04 Possible. It could be mountain hiking the child went to make the connection
AFTTM04 Drowning

BEFTM05 – River; water fountain
BEFTM05 Maybe he had a recent encounter e.g. TV, news, trip
AFTTM05 Water cycle – water coming from machine
AFTTM05 People, swimming in the ocean

BEFTM06 Is getting darker…
BEFTM06 Raining and raindrops
AFTTM06 Flushing, pass motion, poo poo, button, wipe the backside
AFTTM06 Passing motion

BEFTM07 Able to label the event
BEFTM07 Events were drawn but no labelling
AFTTM07 Child was able to connect/relate the toilet as a place where he/she passes urine/motion. Child Was also to understand I recognise the sizes of the toilet bowl. How to use the toilet bowl and its flush

BEFTM08 Drain, shower, toilet, levels of difficulties, describe the process
BEFTM08 Trying to show water cycle from shower room to river & drain
AFTTM08 "taking a bath"
AFTTM08 Able to label – shower, pipes "on", switch, bath tub
AFTTM08 "someone taking a bath in the bath tub"

BEFTM09 Sea
BEFTM09 Rainbow after rain?

AFTTM09 'Princess'

BEFTM10 Drainage of water; water come from rain
BEFTM10 Ocean water
BEFTM10 By association of characters with water
AFTTM10 Raining

BEFTM11 is able to understand that when it rains water is collected into the sea
AFTTM11 Toilet
BEFTM11 Raining
AFTTM11 Can label washing of hands

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

***Interpreting* by giving examples/clarifying/ representing how things/events /people/objects function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material** *(see definitions below)*

a. *Able to* ***give examples by illustrating how things/objects function or associate*** *with something else related to the narrative/theme in their drawing . E.g. The police car and the ambulance always together when there is an accident.*

Respondents' supporting evidence

Drawing Descriptions

BEFTM01: Ship on water; black cloud & rain
BEFTM01 Able to understand that precipitation happen when the clouds became heavy due to condensation
BEFTM01: Able to relate rain with rainbow
AFTTM01: Mermaid must have water. When there's cloud there's lightning and rain.
AFTTM01: Sometimes when there is raincloud there maybe lightning
AFTTM01: Able to associate rain with weather

BEFTM02: Water flows down to sea
BEFTM02: Water flowing down into the big sea

BEFTM02: River leads to sea
AFTTM02: Boat & ladder; boat & water (raining)
AFTTM02: Boat with water
AFTTM02: The ladder used to climb onto the boat

BEFTM03: Fish to swimming associate
BEFTM03: Fishes swim
BEFTM03: River wash away the man; fish swim in the river
AFTTM03: Is able to understand that cold water can become hot
AFTTM03: Cold water loses heat and turns to room temperature. Probably in this case the child feels it turns hot
AFTTM03 Cold becomes hot

BEFTM04: Hot water, cold water
BEFTM04 The flush generates water in the toilet bowl
AFTTM04: Mountain and mountain together its nature
AFTTM04 When there is too much water; drowning occurs
AFTTM04 The person is drowning in the fountain and someone is going to save him/her

BEFTM05: Person swimming down the water fountain which links to a river which could be dangerous – child mentioned 'help'
BEFTM05: Able to illustrate that water fountain is at a greater height compared to river
BEFTM05: Water associate with swimming might also associate swimming with drowning (Help!)
AFTTM05: Water of different temperature warm, cold, hot
AFTTM05: Able to classify warm, cold and hot water

BEFTM06: Associate clouds with thunder, swimming pool with ladder; umbrella on rainy day
BEFTM06 Relate swimming pool to ladder
AFTTM06 The child associate that she flushed the toilet not knowing that it was a baby
AFTTM06 Toilet bowl -pass motion; flushing toilet – flushing button wipe the buttocks
AFTTM06: toilet bowl, flushing button, pass motion
BEFTM07: Able to associate bath tub, shower, crying with water

BEFTM07: Water needed for showering
AFTTM07: Understand that when child need to poo, child need to go
AFTTM07: Able to illustrate that there are water inside the toilet bowl and when flushed it will give the splashing sound and goes into the toilet bowl
AFTTM07: Child was able to relate/identify that the toilet bowl is used for easing one –the different types of toilet bowls sizes – bigger vs small

BEFTM08: Fish and turtle in water shower and toilet water is flowing in river; rainbow after rain
BEFTM08: Motion of water flowing; taking shower, boy crying
BEFTM08: The turtle and fish in the river. Water from the river goes to our drainage system. From there it goes to the drain
AFTTM08: E.g. she need 'to turn on the shower and the pipe to empty out the water'
AFTTM08: "The water can go this way that way"

BEFTM09: Water comes from the sea
BEFTM09: Raining
AFTM09: Child drew a castle by river, maybe associating with castle surrounded the moat & sandcastle by beach
AFTM09: The princess stays inside the castle, river around the castle
AFTM09: The child associate river with castle

BEFTM10: Mermaids and star cruise in the ocean
BEFTM10:Sships on the sea
AFTM10: Able to associate water with drain. Vocab knowledge quite wide by saying ocean. Know rain create or contribute to making ocean. Associate fairy tales into real life (mermaid) know ocean have dolphin & whale
AFTTM10:Starcruise, dolphin, whale, rain & ocean
AFTM10: Rainbow associated after the rain, drain, starcruise with sea

BEFTM11: Clouds, lightning, rain, sea water
BEFTM11:Understands that when it rains, there would be present of clouds and lightning
BEFTM11: Dark clouds, lightning, rain
AFTM11:Water comes from sink
AFTM11:Water flowing out of tap of sink
AFTM11:Knows that water comes from sink; wash hand must be in sink

2 UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

b. Able to **give examples by illustrating how people function or associate** with something else related to the narrative/theme in their drawing. E.g. The doctor wears a stethoscope and he/she treats sick people in the hospital

Respondents' supporting evidence

Drawing Descriptions

AFTM01 Mermaid must have water

BEFTM02: People sliding down the water
AFTTM02: People sit on the boat
AFTTM02: Person sit on the boat in the sea
AFTM02: Man sitting on boat

BEFTM03 :River flows
BEFTM03: Associating to Einstein (genius) maybe the child think so this is his masterpiece as he can draw genuiously

BEFTM04: Use flush for toilet bowl and taps for sink
BEFTM04: Hot water cold water
AFTTM04: The person who is in danger of drowning is asking for help. The other figure is ready to help him or her

BEFTM05 Stick man drawn with wide arms – shows indication of help
AFTM05: People and duck are swimming in the water

BEFTM06: mother feeling cold on a rainy day; sad face of unhappiness
BEFTM06 mummy feeling cold because its raining
AFTTM06: child & friend want to pass motion, so go to toilet
AFTTM06 Pregnant feels stomach ache & she went to pass motion instead she gave birth to a baby & flushed it away
AFTTM06: my friend, pass motion, wipe backside

BEFTM07 Human beings can do the routine drawn
AFTTM07:Toilet- sit on the bowl understand the process
AFTTM07: Able to show that people goes to the toilet each in different cubicle and able to illustrate that people sits on the toilet bowl
AFTTM07: Child was able to identify the pants – one must pull down the pants before poo poo

BEFTM08: Person is showering in the toilet
BEFTM08: Shower head in the toilet there is bridge and the river

AFTM09: The princess stays inside the castle.

BEFTM10: Mermaids on the rocks
BEFTM10: Mermaids sitting on the rock with their fish tails
AFTM10: Mermaids associated with rock, fishes in the ocean

AFTM11: Wash hands at the sink
AFTM11: People washing their hands
AFTM11: Girl wears a dress; boy wears trousers; girl has long hair/boy has short hair

2 *UNDERSTAND* *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support your rating....**

c. *Able to **give examples by illustrating how actions function or associate** with something else related to the narrative/theme in their drawing. E.g. the little boy kicks the ball and it hits the goal posts.*

Respondents' supporting evidence

Drawing **Descriptions**

AFTM01 Cloud + lightning –rain

BEFTM02 The people being washed into the sea
AFTTM02: A ladder to climb the boat

AFTTM02: Sit
AFTTM02: Raining
AFTTM02: There's a flag on the boat, indicating its function to the boat

BEFTM03:Man flies away
BEFTM03: Maybe the child is experienced or seen Tsunami
BEFTM03: Able to predict what happens if river water hits the man

BEFTM04:Flush
AFTTM04: Able to show help is needed and able to create a character to render this help
AFTTM04: Water fountains can be found in mountains. Child knows that there are different sources of w

BEFTM05:Flow of water fountain- up then down; flow of river - downstream
AFTTM05: Able to associate duck swimming in the water
AFTTM05: Duck swimming in the ocean water

BEFTM06:Umbrella needed for a rainy day
BEFTM06: Ripples in the swimming pool
AFTTM06: Pass motion in the toilet
AFTTM06: The child analyse that after she pass motion she flushed the toilet
AFTTM06: The girl pass motion and did not wipe backside and she flushed using the button

BEFTM07: Able to associate sadness and happiness
BEFTM07:A child crying, tears (water)
AFTTM07:Sit down & poo process of toilet flushing
AFTTM07: Also able to illustrate that human waste is inside the toilet bowl
AFTTM07: I like the last drawing where the child was sitting on the toilet bowl. The boy who was sitting on the toilet bowl looked very happy. The other two pictures also showed the boy happy faces when he poo poo

BEFTM08: The water will always flow into the drain

BEFTM08: The water from the person's bathroom at level2 is going into the drain. When water falls it will go into the drain
AFTTM08: The water can go this way that way different directions

BEFTM09: Water comes from the sea

BEFTM10: Ocean water that goes into the drain
BEFTM10:Water & drain; rain & cloud; mermaids tails with carrot
AFTTM10 : Someone threw a carrot into the ocean
AFTTM10 : Drainage system

BEFTM11: Raining
AFTTM11: Both boy & girl know that water is for washing hand

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

Classifying by categorizing/subsuming things/events /people/objects according to functions/ placement etc. *(see definitions below)*

d. Able to classify by ***organising/ categorizing things/objects according to functions/ purposes/ placement*** *etc in their drawing. E.g. grouping things such as bed, cupboard, pillows etc. sky, bird, sun (higher level) etc. tree, grass, flower (lower level)*

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Rainbow & cloud higher end of drawing; sea at bottom
BEFTM01: Able to cluster rainbow, cloud and rain
BEFTM01: Able to classify the placement
AFTTM01: Group mermaid together; waterfall together & water cycle together
AFTTM01: Waterfall comes after the water edge

BEFTM02: Sun-high level; water flush; sea water-low level
BEFTM02: Sun is at high level; sea is at low level

BEFTM02 People are drawn in the vertical direction when sliding down; sun in higher level
AFTTM02: Cloud is placed on top of the rain. Rain fell into the water
AFTTM02: Cloud above, rain falling to the water, boat above the water
AFTTM02 : Cloud on the top, water, sand at bottom of drawing

BEFTM03: Categorizing different environment; fish-water; for fish & man; man-land
BEFTM03: Fishes swim together
AFTTM03: Scientific process of cold to hot
AFTTM03: Group things like apples, grapes

BEFTM04: Flush at toilet bowl and taps at sink
BEFTM04: Toilet bowl & flush
AFTTM04: Mountain, fountain and water

BEFTM05:Water fountain flowing downward; river at lower level
BEFTM05: River (bottom); water fountain (higher)
BEFTM05: Associate water with blue colour
AFTTM05: Duck swimming in natural setting eg. Ocean; water coming from machine eg. Swimming pool; jacuzzi
AFTTM05: Able to classify warm, cold, and hot water
AFTTM05: Warm, cold, hot water

BEFTM06: Sky, pool at the bottom
BEFTM06: Clouds at high level; thunder & swimming pool medium level; mother & girl at bottom
AFTTM06: Child organise things associated to the toilet
AFTTM06: Toilet bowl, pass motion, flush the toilet, never wipe the backside
AFTTM06: Toilet bowl, flushing button

BEFTM07: Able to group toilet and human separately
BEFTM07: Shower & bath tub; tears
AFTTM07: Understand & organising the process of poo & where it goes

AFTTM07: Able to place each individual in different cubicle
AFTTM07: Child was able to classify the toilet bowls according to their sizes. However the child needs to draw the flush button to indicate where to press the flush

BEFTM08 Turtle & fish in river; water in river; rainbow & rain in sky
BEFTM08: Water flowing to drain, river
BEFTM08: Turtle, fish, river 2) people-drowning 3) water from toilet to drain 4) rain to drain
AFTTM08: e.g. 'on' the shower and the pipe to empty out the water
AFTTM08: The water can go this way, that way; this is to 'on' shower
AFTTM08: The child classify the drawing as a bath scene

BEFTM09: Associate the nature and weather, sun, rain, star, sea. Fish lives in water/sea
BEFTM09: Fish, water (lower) sun, raining, star, rainbow (higher)
BEFTM09: Fishes at the bottom, stars all over the sky, rainbow & sun higher level
AFTTM09: Child drew castle with river, probably associated with sandcastle or mystical isolated castle in fairytales; child drew floating fruits on the sea, probably child seen floating coconuts before/
AFTTM09: Sea is placed below apple, orange float on water
AFTTM09: The child is able to classify fruits on line

BEFTM10: The things drawn are in relation to the ocean
BEFTM10: Rainbows, cloud, rain
AFTTM10: Able to group dolphin & whale at sea level; starcruise at sea level & rainbows & rain above
AFTTM10: Lower level: fishes & drain; Mid level: mermaid, star cruise; Higher level cloud, rain, rainbow

BEFTM11:Cloud, rain, sea water
BEFTM11:Sea water & rain water are water sources
BEFTM11:High level organizing of things which forms when it rains, dark clouds, lightning
AFTTM11: Boy toilet; girl toilet
AFTTM11: Can classify boy & girl toilet

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

*e. Able to classify by **organising/categorizing events or experiences according to occasions / causes** etc. in their drawing. E.g. birthday celebration, sports day etc. family outing etc.*

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01 Able to relate experience of family holiday in a cruise ship to the water cycle
BEFTM01 Yes able to classify the event

BEFTM04 cold/hot water
AFTTM04 able to classify experience could have go on mountain hiking before
BEFTM05: drowning, sprouting mouth show person in distress
BEFTM05: if drown, immediately ask for help; able to use the correct language e.g. "help"
AFTTM05:NIL
AFTTM05: groups of people swimming together

BEFTM06: rains, and mummy feels cold
AFTTM06 experience of relieving herself in the toilet and know what to do after that such as flushing the toilet
AFTTM06 Going to toilet
AFTTM06: passing motion, wipe backside, flush

BEFTM07 Able to associate shower & bath as happy
BEFTM07:child drew both tub and shower together

AFTTM08: associate water with bathing

BEFTM09: fish in water so its' underwater (at the lower level)
BEFTM09 Sea view

BEFTM10: Star cruise - vacation
AFTTM10: Family outing/holiday cruise; rainbow after rain

BEFTM11: Raining

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

f. Able to classify by ***organising/categorizing people according to functions/gender/relationships/occupation/ placement*** etc in their drawing. E.g. grouping doctors, nurses, ambulance attendants etc. daddy is taller than mummy and mummy is taller than the child etc.

Respondents' supporting evidence

Drawing **Descriptions**

AFTTM01:Yes there is grouping

BEFTM02:Long hair and no hair to differentiate the gender
AFTTM02: Boat, is on the water surface
AFTTM02: People same height as the boat

BEFTM04: Flush to toilet bowl; sink to tap
BEFTM04: Categorise blue tap for cold water and red tap for hot water

BEFTM05: Grouping river and water fountain together as they share the element of water
AFTTM05: Different pools for different water temperature and people swimming in it
AFTTM05: Every group has 2 girls and 1 boy

BEFTM06: Categorize mother & herself c long hair; drew herself smaller & shorter than mother
BEFTM06 She drew mummy is bigger than her
AFTTM06: Mother gives birth to baby in the toilet

AFTTM06: Friend

BEFTM08: individual bath in a shower area (room), fish/turtle live in water

BEFTM09: Rain, star, sun, rain – up in the sky
AFTTM09: Princess stays inside the castle

BEFTM10: Mermaids sitting on rocks by the ocean
AFTTM10: Grouping fishes, mermaids; grouping rain, rainbow

AFTTM11: Can categorise by gender
AFTTM11: Boy toilet; girl toilet; children taller than sink
AFTTM11: Girl in girl toilet; boy in boy toilet

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

Inferring **by comparing, explaining, predicting, concluding the causal-effect of things/events/people/objects** *(see definitions below)*

g. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of things/objects*** in their drawing. E.g. the little boy threw the ball so the window broke.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Able to concur that the rain will fall when the clouds are heavy
AFTTM01: Cloud+ lightning = rain
AFTTM01: Waterfall at the water edge

AFTTM02: From clouds – rain water – water on the sea
AFTTM02: Rain fell, raining on the boat (boat can get wet)

AFTTM02: People climb ladder the boat

BEFTM03:The child understand that the wave will wash away the man
BEFTM03: Man is going to let river wash away
AFTTM03: Cold becomes hot

AFTTM04: A man standing on mountain, trying to have a clearer view of fountain
AFTTM04: 'The water is going to drown' and he saving this person' -explains

BEFTM05: Person swimming down the water fountain to the river shows that the person needs help
BEFTM05: Water fountain having gushing out effect; river have ripples
BEFTM05: Heavy current from the water fountain, thus fear for his/her life

BEFTM06: The swimming pool has a ladder, raindrops came from cloud
BEFTM06: Sky turns dark leads to raining; rainy day need umbrella if not will be cold like mother; raindrops from cloud
AFTTM06: Shows evidence of knowing that the toilet bowl is where people relief themselves
AFTTM06: She pass motion she flushed she didn't wipe her backside
AFTTM06: Flushing button, flushed away

BEFTM07: Bath tub is to sit shower is by standing
BEFTM07: Showering
AFTTM07: Able to know water comes out & eventually flush out to the circle
AFTTM07: Able to show human waste in the toilet bowl and water is in the toilet bowl
AFTTM07: Child able to identify I know where to pass motion; pass motion in the toilet bowl and not outside elsewhere

BEFTM08: Water cycle when water fall in drain it will recycle as tap water
BEFTM08: Water from shower
BEFTM08: River water to toilet, toilet water to drain
AFTTM08: Shower and then the pipe to empty out the water
AFTTM08: The steps of bathing 'on the shower" "pipe to empty" "water go this way, that"

AFTTM08 : Water can change different direction

AFTM09: Child understand some fruits do float on water
AFTM09: Apple & oranges seem to be floating on the sea

BEFTM10: Ocean water running into drain; fishes swimming in the ocean
AFTTM10: Someone threw carrot into the ocean. Rain goes into ocean water flows from drain into ocean
AFTTM10: After rain, there's rainbow water will flow into the drain

BEFTM11: Water from the sea comes from rain water, dark clouds is associated with rain, when there is rain there is lightning
AFTM11: Water comes from the sink
AFTM11: Able to understand that water comes from the tap and is drained down the pipes

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

h. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of events*** in their drawing._____ E.g. the two children quarrelled because they refused to share the toy.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Able to predict that rainbow appears after rainfall
BEFTM02 : The water washes the people into the sea

BEFTM03: The child speaks about the Tsunami effect

BEFTM06: Mummy got wet because she has no umbrella. She is feeling cold
BEFTM06: Raining causes collection of water in the swimming pool

BEFTM05: Once falling on the water fountain, he predicts he might fall in the downstream river next

AFTTM04: Slipped and fell & drowning
AFTTM04: 'The water is going to drown' and he saving this person' –explains drowning occurs if a person is trapped in there

BEFTM07: Associate cry to sadness

AFTTM07: Able to know the process of what's comes next after the child poo

BEFTM09: Weather is hot (with the sun) when it rains, water goes to the sea. After rain, there's the rainbow

BEFTM10: Ocean water goes into the drain
BEFTM10: As it rained there was a rainbow
AFTM10: Mermaids happy basking in the sun; rainbow after the rain; water flowing into the sea

BEFTM11: Is rain, there is lightning

2. UNDERSTAND *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

i. Able to ***conclude/predict understanding by comparing & explaining the causal-effect of <u>people</u>*** in their drawing. E.g. the policeman chases the bad guy because the bad guy damages the car

<u>Respondents' supporting evidence</u>

<u>Drawing</u> **<u>Descriptions</u>**

BEFTM02: People calling for help
BEFTM02: The people say help because they may drown in the sea
BEFTM02: Able to conclude that people ask for help as they slide down

BEFTM03: Conclude that man will follow the flow of river as the water can wash him away from shore

AFTTM04: The person is drowning and so there is someone to save him/her

BEFTM06: Rainy so mummy cold
BEFTM06: Mother is upset due to no umbrella and was caught in the rain, hence feeling cold
AFTTM06: Need clear poo poo go to toilet
AFTTM06: Know the consequences of not wiping herself clean and drawing a person vomiting
AFTTM06: She flushed she didn't know that the poopoo is baby just flushed away

BEFTM05: Person with sad face, calling for help
BEFTM05: Lose control while swimming; thus put himself in danger; with the drawing of the 'sun' it show his positivism; hope for surviving
AFTM05: Smiles on faces

AFTTM04: Understand there is danger and man on other side wants to help

BEFTM07:When a child cry, there is tears (water)
BEFTM07: When a child cry there is tears (water)
AFTTM07: Able to know what comes next after child poo
AFTTM07: Child knew where to pee and poo – Happy faces

BEFTM08: For individuals on different levels, water flow through different areas eg. River, drain

BEFTM03: Man has to escape
BEFTM03: Man is scared because he is flush away by water

AFTM10: People in the star cruise threw carrot into the ocean

AFTM11 She is washing her hand. Water comes from the sink

3 **APPLY** *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why- Things /objects / people /events come from & where it goes *(see definitions below)*

a. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why things/objects*** are involved in the process. E.g. the ambulance is needed in order to fetch the injured people to the hospital so the doctor can help the injured man.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Black cloud & rain; ship on water
AFTM01 Mermaid need water to swim
AFTM01 Rain cloud and lightning

BEFTM06: Umbrella with rain
AFTTM06: Things associated with toilet
AFTTM06: After flushing the toilet she did not wipe the backside

BEFTM05: Water causes drowning
AFTTM05: Water come from machine

BEFTM03 Water flows freely

BEFTM04: Able to draw the movement of the water
BEFTM04: There is water in both toilet bow and sink correctly
AFTTM04: The person who is trying to save the other holds onto a lifeboard
AFTM04: To render help when someone needs

BEFTM02: Water comes from top going to sea
AFTTM02: Raining

AFTTM07: Clear understanding of how the process goes
BEFTM07: Able to associate water to bathtub and shower

BEFTM08: The water will flow in the drain and river thus there is water for showering
BEFTM08: River water, there is fishes and turtle in it
AFTTM08: Drew the pipes, bathtub
AFTTM08: Bathing requires: "bathtub, showerhead, water 'on' tap, pipe
AFTTM08: The pipe to empty out the water

BEFTM10: Water cycle of how it rains water in the ocean flows into drain
BEFTM10: Rain from sky
AFTM10: Carrot doesn't belong in the ocean someone threw it in

AFTM10: The drain is important so that the water will flows back into the sea

BEFTM11: Rainwater, seawater
BEFTM11: Is able to apply that rain and water bodies are involved in the water cycle
AFTM11: They know the procedure: open tap – wash hands- water is then discharged into pipe

2 APPLY *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why people come from and where they go.*** E.g. mummy comes from the office to pick me up from school and we are going home now.

Respondents' supporting evidence

Drawing **Descriptions**

AFTTM06: Pass motion must go to toilet bowl
AFTTM06: Mother gives birth to a child when she feels she has a stomach ache

BEFTM05: Shows water fountain leading to river
AFTM05: Able to say hot & cold water came from machine

AFTTM03: The flavour sea come from the rain
AFTTM03: Chocolate drink, orange drink

AFTM04: When someone's drowning, there could be others to the rescue

BEFTM02: People falling downward following the flow of water into the sea
AFTTM02: People sit on the boat

BEFTM07: Able to draw where water come from
AFTTM07: Go to the toilet- sit on the bowl flush and go

AFTM10: People go on star cruise trips
AFTM10: Holiday trip on star cruise

BEFTM08: Water is recycled from river and drain
AFTTM08: The steps of where water come & flow "on shower" 'bathtub' 'filled with water' 'water drain out through pipe"

AFTM11: Girl go girl toilet; boy go boy toilet

2 **APPLY** *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. Execute by carrying out in ***drawing a procedure to determine what/where/how/when/why events happen and its outcome***. Eg. When there is thunder and lightning there will be a heavy rainfall etc.Is my birthday so there are many presents/food/people in my party.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Black cloud & rain; ship on water
BEFTM01: Able to draw the procedure of where, when and how rain falls
AFTM01: Very clearly show cloud+lightning = rain
AFTM01: Rain and lightning
AFTTM01: Lightning and cloud is showed in the drawing to relate to rain

BEFTM02: The people are being swept into the sea so they are shouting for help
AFTTM02: Cloud to raining

AFTTM04: When someone is in danger, there is help

BEFTM05: When there is danger, person calls for help
BEFTM05: When there is strong current; you will be drowned/suffocated
AFTM05: People swimming

BEFTM06:The sky will get darker and there will be thunder when it rains
BEFTM06: Dark clouds results in rain
AFTTM06: Child is able to know that when relieving ourselves, we should flush and clean ourselves

BEFTM07: Facial expression cry; happy

BEFTM08: There is rainbow in the sky

BEFTM08: Water from shower head flowing downwards to river & drain through a pipe
BEFTM08: Water from the river is needed for human use
AFTTM08: After shower the pipe will clear the water and can go different directions

BEFTM09: When it rains, water falls into the sea. But conclude the water comes from sea

BEFTM10: After it rains, rainbow appears
BEFTM10: Water from drain goes to the sea
AFTM10: Rain & rainbows
AFTM10: Rainbow after rain; water flows into drain

BEFTM11: When there is lightning and dark clouds there will be rain

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*

a. ***Differentiating people/events/ things/objects by distinguishing / selecting relevant from irrelevant parts*** or important from unimportant parts of the presented material E.g. in the drawing the child is able to differentiate things belonging to a car and not of an aeroplane.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: She drew things that are relevant to water cycle such as ocean, black clouds and cruise ship
AFTM01: Mermaid needs water; waterfall falls; cloud+lightning= rain

BEFTM02: Blue colour for water; yellow for sun
AFTTM02: Boat on the sea
AFTTM02: Water to boat to flag
AFTTM02: Associate boat with water at jetty

BEFTM03: Fish belongs in the water
AFTTM03: Is able to associate the flavour with a colour

BEFTM04: Cold/hot water

BEFTM05: Relating to theme: water, fountain and river
BEFTM05: Differentiate between water fountain and river; differentiate the flow and the current in rivers and fountains
AFTM05: Differentiate people from animal ie. duck

BEFTM06: Ladder belongs to swimming pool
BEFTM06: Ladder with swimming pool
AFTTM06: Child associate events and things in the toilet
AFTTM06: Toilet bowl, flushing wipe the backside

BEFTM07: Drew things that used water e.g. shower/bath tub
BEFTM07: Drew things that used water e.g. shower/bathtub
AFTTM07: That human waste is in the toilet bowl. Human figure wearing underwear in the toilet
AFTTM07: I like the way the child drew his toilet bowl. The outline of the toilet bowl was there

BEFTM08: Turtle & fish need water to survive. Bridge over water
BEFTM08: Sea creatures, live in water e.g. turtle, fish
BEFTM08: Toilet to pipe to drain
AFTTM08: Parts of the shower and bathtub
AFTTM08: Things involve with bathing present. Bathtub, showerhead, tap, water, people

BEFTM09: Star seems prominent in the drawing
BEFTM09: Fish in the sea, rainbow, star, rain, sun in the air
BEFTM09: The rain that drop into the sea & the sea water are how water is formed as it comes from the sea

BEFTM10: Carrot appears by the corner not in relation

AFTM10: Able to know what belong to where
AFTM10: Able to draw dolphin & whale in the ocean the starcruise at ocean level & rainbow in the sky
AFTM10: All in order

BEFTM11: All things drawn are closely related to each other
AFTM11: Dress for girl; pants for boys
AFTM11: Child able to draw things found in toilet
AFTM11: Can differentiate various things –clothings, hair, types of toilet

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. ***Organizing people/events/ things/objects by finding coherence / structuring how elements fit or function*** within a structure/situation E.g. in the drawing the child is able to organize elements that constitute a birthday party (balloons, presents, food, streamers, people) organizing & attributing how parts of the event relate to one another to give an over-all meaning to the drawing.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM01: Able to correctly draw coherently the process of precipitation and collection
BEFTM01: Organizing the event
BEFTM01: Cloud, rain, sea
AFTM01: Able to know when there is rain, there's rain cloud

BEFTM02: There is a sun to indicate the place as outdoor and sunny day
AFTTM02: Flag on the boat; ladder to climb on the boat
AFTTM02: Water, boat, cloud
AFTM02: Use ladder to get into boat

BEFTM03: Fish is swimming inside the water
BEFTM04: Able to draw what is found in the toilet eg. Toilet bowl, sink
AFTM04: The associate of water, mountain, fountain, drowning

BEFTM05: Has the concept and understanding that after an upstream fountain; comes a downstream river; instead of other structures
AFTTM05: Natural setting versus man-made pool

BEFTM06: Rain, thunder, darker sky, umbrella, cold
BEFTM06: Dark sky with thunder and rain associated with umbrella
AFTTM06: By flushing the toilet after use
AFTTM06: Toilet experience

BEFTM07: In the toilet there are either bath tub or shower
AFTTM07: Able to organize her basic thoughts
AFTTM07 Child knew where he's suppose to do his bowels (at home toilet, school toilet)

BEFTM08: Shower head appear in toilet ; Rainbow in sky; water in the drain
BEFTM08: Water from shower room flowing into outdoor eg. River, drain (drawn with grills)
BEFTM08: Water cycle with human usage
AFTTM08: Things involve with bathing present: bathtub, showerhead, tap , water, people and also specificly situated. Water flow from top to bottom

BEFTM09: Fish in the water. After it rains, there's rainbow by the side of the house
BEFTM09: Objects in the sky and water
BEFTM09: Child is able to draw things that is in the sea setting
AFTM09: The castle was drawn in layers castle surrounded by the river

BEFTM10: Child's drawing shows mostly things in relation with the ocean
AFTM10: Mermaids belong to the sea; fishes in the sea; rainbow in the sky

BEFTM11: Child able to organize thoughts e.g. rain full into sea water
AFTM11: Sink, pipe
AFTM11: There are sink and pipes and toilet signs in toilet
AFTM11: Knows that sink is found in a bathroom; girl goes to girl toilet & vice versa

4 ANALYZE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. ***Attributing people/events/ things/objects by deconstructing to determine a point of view, bias, values, or intent*** **underlying the situation** E.g. through drawing the child is able to attribute a point of view "this is a naughty boy because he snatches the girl's ice cream" etc.

Respondents' supporting evidence

Drawing **Descriptions**

AFTM02: Person sitting on the boat

BEFTM03: The man is scared because he sees the water will wash him away

AFTM04: Able to sense danger that someone should render help
AFTTM04: The child shows optimism through her drawing. There is help for those who ask

BEFTM05: Person in danger calling for help
BEFTM05: NIL; AFTTM05:NIL
BEFTM05: Child fall from fountain, drown himself and cries for help because he is fearful for his life

BEFTM06: Mummy doesn't have an umbrella mummy gets wet and feels cold
BEFTM06: Mother feeling cold due to rain

BEFTM07: Sadness means to cry; happy means to do the things they like

BEFTM08: The boy is crying as both the toilet are occupied
AFTTM08: Water flow out from the bath-tub?

BEFTM10: Mermaids need to sit on the rocks
AFTM10: Two rainbows make the sky good/water flows from drain to ocean
AFTM10" Mermaids very happy because there is 2 rainbow

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

Make judgments based on criteria and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*

a. ***Checking by drawing to determine things*** e.g. the child falls from the bicycle and hurts himself he cries because it is painful etc. This is the bad guy he wants to fight the good people etc. Lightning has really struck the tree and caused it to collapse from observed data in the environment/ experiences etc.

Respondents' supporting evidence

Drawing **Descriptions**

BEFTM02 the people shouting for help as they slide down

BEFTM06: Feeling cold because mummy have no umbrella
BEFTM06:NIL; AFTTM06:NIL
AFTTM06 pass the motion & wipe the backside

BEFTM05: might have encounter drowning before
BEFTM05: mouth; eyes; legs & hand gestures; strokes for fountain & river
AFTTM05:NIL

BEFTM03 relating to his/her prior knowledge
AFTTM03:the drawing is called flavor of sea cos there is different flavours in drinks

AFTM04 Able to make judgment that drowning might occur
AFTTM04 The figure is drowning in the water and so he/she asks for help

BEFTM07 He cried because he is sad. Happy expression shown to get things done
BEFTM07:need water to shower/bathe
BEFTM07 need water to shower/bathe

AFTTM07: child able to understand cause & effect knowing the fact that water swirl and splashed goes into a circle
AFTM07 : the last drawing show the child able to sit securely on the toilet bowl to prevent himself from falling. Good thinking skills
BEFTM08 The rainbow appear in the sky
BEFTM08: much water movement in picture depicted by lines
AFTTM08: someone taking in bath in the bath-tub
AFTTM08 the person is bathing and is happy about it

BEFTM11 drawing depicts water cycle quite accurately
AFTM11 sink is as tall as person to reach to wash hands
AFTM11 Logical: know that water is for washing

BEFTM10 Rainbow appears in relation to rain and water flows into drains
AFTM10 after rain there's rainbow Rain goes into ocean
AFTM10 2 rainbow makes the sky good – people throw carrot in the ocean

5 EVALUATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating....**

b. Critique by judging and detecting inconsistencies and appropriateness (in humour or comic like drawing) of a procedure/behaviour in a situation in drawing e.g. this bad guy has three eyes etc. or this little girl has a nose like Pinocchio; so big and red and child laughs at his /her own drawing.

Respondents' supporting evidence

Drawing Descriptions

AFTM01 mermaid must have long hair

BEFTM03 "Einstein-inspired" river
BEFTM03 the child compares himself to Einstein as (he was a genius) so the child thinks by drawing this he is genius too.

BEFTM06:NIL
AFTTM06:poo poo, she thought it is baby, flushed

AFTTM06: by flushing the baby away
AFTTM06 She flushed she didn't know that the poopoo is baby just flushed away

AFTM07: The child got concept/idea of big/small. First and last drawing. Child's head was small; second drawing child's head was big

BEFTM05:NIL;AFTTM05:NIL
AFTM05 Girls have hair, eyes & mouth. Boy only has eyes & mouth

AFTM09: fruits on the sea

BEFTM10 A carrot appears in the corner for humour
BEFTM10 carrot in the sea?
AFTM10 the mermaid's tails resemble a carrot so child drew a carrot then knowing carrot doesn't belong in ocean, child said someone threw it in
AFTM10 The carrot is out of place mermaid with 1 strand of hair

AFTTM08 stickman

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

Generate by planning & producing by putting elements (things/events/ people/objects) together to form a new pattern or structure or a coherent/functional whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. The development of a drawing to convey ideas, feelings, and/or experiences to others effectively. Or the proposal of a plan of operations given to the child or which the child may develop for him/herself. *(see definitions below)*

a. ***Generate by coming up with alternative hypotheses based on criteria to account*** for an observed situation in drawing. E.g. the mummy is angry because the girl/boy breaks her window; the girl cries because the boy bursts her balloon.

Respondents' supporting evidence

Drawing **Descriptions**

AFTM01 Mermaids want to swim but waterfall too dangerous & its going to rain

BEFTM02 the people shout for help because they are afraid of drowning

BEFTM03 the river flows towards the man
BEFTM03 the man is scared as the wave is approaching him
AFTTM03 use colours to indicate different types of water

BEFTM06: Thunder, sky gets darker, so it rains
BEFTM06:NIL; AFTTM06:NIL
AFTTM06 she pass motion, she flushed she didn't wipe her backside

BEFTM07: water don't only come from tap it comes from tears too

BEFTM08 The person cried because the toilets are occupied
AFTTM08 The water can go this way that way

BEFTM05:NIL;AFTTM05:NIL

BEFTM10 Mermaids are happy as they have friends over there
AFTM10 the mermaid's tails resemble a carrot so child drew a carrot then knowing carrot doesn't belong in ocean, child said someone threw it in
AFTM10 The mermaids are happy because 2 rainbows makes a good day

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

b. ***Plan by designing a procedure to accomplish a task in drawing*** e.g. the child designs an electrical pathway to track how the light bulbs are lighted up etc. design a road map to track his/her home to school journey.

Respondents' supporting evidence

Drawing **Descriptions**

AFTM01 The formation of water fall, the rain cycle

BEFTM03 planning the flow of the river

BEFTM04 colouring the hot & cold water in different colours

BEFTM06: design a ladder for pool
BEFTM06:NIL;AFTTM06:NIL
AFTTM06 Drawing the toilet bowl, flushing button

BEFTM05: NIL;AFTTM05:NIL

AFTTM02: water to floor to sand to ladder
AFTTM02: ladder to climb onto the boat

BEFTM08 The process of water recycle
BEFTM08: river to toilet to pipe to drain
AFTTM08: show how the water flows from the bath tub to the pipes
AFTTM08 the child drew a person bathing to determine the action
AFTTM08 Design the path/flow of water from bath tub to pipe
BEFTM09: understand basic of water cycle
BEFTM09 drew sea water at the bottom, sun on top; rain at the side; stars to fill the empty space

BEFTM10 Child shows the water cycle (rain- ocean- drain)
AFTM10 child is able to categorize the drawing according to what belongs and what doesn't belong at specific locations
AFTM10 waves of the ocean – show that there is strong current

AFTM11 Design toilet with sinks and even labels them appropriately

6. CREATE *Please rate the drawing in a scale of* ***1 (Least Evidence)to 5 (Most Evidence)***	**The evidence as seen in the drawing to support my rating...**

c. ***Produce by constructing or inventing in drawing a model or product*** e.g. a flying house (drawing a pair of wings next to a block of flat); this is a rainbow house (draw colourful strips as roof over a house) etc.-

Respondents' supporting evidence

Drawing **Descriptions**

AFTM01 Colourful waterfall

BEFTM06: raindrops (drops)
BEFTM06:NIL;AFTTM06:NIL
AFTTM06 drawing poo poo and the toilet bowl

BEFTM05:NIL;AFTTM05:NIL
AFTM05 Duck has webbed feet & wing

AFTTM03: the child is able to invent a sea of flavours a very abstract idea of
AFTTM03 the flow of water

AFTTM02: colourful rain

BEFTM09: depict colourful rainbow near a house

AFTM10 four circular star cruise ship
AFTM10 two rainbows make the sky good
AFTM11 (same as above) Design toilet with sinks and even labels them appropriately

Respondents' feedbacks on the drawing evaluation checklist Appendix G4

Respondents' Feedback on Rating Wild Animals Drawings			
No	**Name**	**Strengths**	**Weakness**
1.	Shandy Su	*I like the examples given. It's helpful in guiding me to answer the questions. The 'evidence' comment box is a good choice as it helps support my ratings Questions are clearly stated Highlighting main points*	
2.	Serena Ho	*Is a powerful tool to show that children's drawing has a lot of credit- for children's intellectual, cognitive development – child can interpret to evaluate & create*	
3	Amutha	*Checklist shows various aspects of analyzing drawing. Shows how thinking processes are interlinked are through assessing certain expressions do overlapped.*	
4	Stella Su	*Areas are clearly explained. Hence allowing me to analyze objectively. Sub-areas are divided into people/objects separately. Thus, allowing us to think which area children need to better improve on Examples are given for each sub-areas. Help me to better understand what to look out for. Evidences to support rating helps to backup rating. Good!*	*Overall remarks for teachers to add in more information at the end e.g. comments box so as to add in additional information that the child had displayed but cannot be categorised into the 6 main areas. A list to refer e.g. In Remember area. If a child scores 6/15 what are some recommendations for teacher to help children in a particular area*
5	Anonymous	*Looking at children's drawing from a different perspective. The evaluation form was very specific. Needed some time to fill up*	*The evaluation form can be improved by giving wider columns & lines to write the evidence Pointers in the evaluation form can be a bit precise*
6	Mui Choo		*Need time to digest in order to be able to do the rating. Need more practice. Quite confusing for me. Complicated. Not sure the rating scale from 1 to 5.*

7	Anonymous		*Label the rating specifically. Give more examples*
8	Ser Hui	*A useful tool as it acts as a guide in evaluating the drawings in a systematic manner especially for first-timer. Personally, I would need more time to familiarise myself with the form in order to give better feedback.*	
9	Anonymous	*I feel that the rating scale is very helpful for teachers to assess children's level of understanding and cognitive processes.* ***It is also easy to use, once you get past the overlapping of processes.*** *This assessment is also helpful in assisting teachers' planning of lessons. Thumbs up!*	
10	Anonymous	*It is a good tool to gauge the child's level of competence in factual knowledge as well as their emotional stage because if a child has a sense of humour it will reflect in the drawing. Humour reflects a higher level of emotional competency. See lots of potential in this tool to gauge PIES! All the best soon-to-be Dr. R Chan*	
11	Anonymous	*Useful as it gives us a structure- know what to look out for in children's drawings Takes time to get used to the terms on the form, although having examples helps Also difficult to determine what rating to give –* ***but will expect this to become easier as we are exposed to more drawings*** *Would be easier for professionals to use than for parents How do we interpret the total score?*	

Respondents' feedbacks on the drawing evaluation checklist Appendix G4

Respondents' Feedback on Rating Water Cycle			
No	***Name***	***Strengths***	***Weakness***
12	Megawati	*Very systematic way of explaining the process of thinking never thought that simple thinking process involve many aspects*	
13	Dawn Chan	*The checklist is good: provides examples for each subcategory*	*What do I do with the rating?* *Quite broad 1 to 5 rating* *Rating scale to vague; give example per each rating scale*
14	Umavathi		*The checklist is not clear (option a, b, c)*
15	Norsidahwati Binte Ja'afar		*Too wordy* *Should be simple, straight to the point*
16	Sharon Lim	*Good to have examples*	*Space too small for writing*
17	Chandar Prabah Rai	*Too wordy, had to re-read to understand*	*Organized, well-classified*
18		*Wordy might want to lessen the words for easy reading*	
19	Sazilah		*Make the example more related to the theme* *Are the answers and questions meant to be repeated?* *How are we suppose to rate? By the amount of evidence?* *What if they don't show the water cycle but just a little understanding, thus not much is being shown?*
20	Siti Norazakiyah Bte Jamel		*Space to write evidence is too small*

Respondents' feedbacks on the drawing evaluation checklist Appendix G4

In-service Teachers' Feedback on Rating Checklist (7 Teachers)			
No	***Name***	***Strengths***	***Weakness***
21	Anonymous	*It helps me to analyse and evaluate what the drawing is all about. It helps me to understand the child's thinking, creativity and imagination. It gives a useful insight of child's dream and his/her perspective of the world* *I think it is good becos eg. (example) given is simple and straight forward*	
22	Irene Tay	*Able to help the child to move to the next level.* *Grasps and understand the child's inner thoughts* *Able to analyst the drawing to parents in a different perspective hence, help parents to understand their children better.*	
23	Linda Cher	*It helps me to analyze the child's drawing and I am able to have a better understanding of each individual child's drawing.*	
24	Rosni	*It is full of details and of examples. Checklist is well documented and in sequence*	*The rating scale with as such 1; 2; 3; 4; 5 then all we have to do is shade or tick it rather then just write the rating down*
25	Claudia Yong	*There are examples for us to know how to rate the drawing* *Categorized in the different process so that it is clear to understand the checklist* *It is straight forward and easy to understand*	
26	Lee Sun May	*It gave many details & explanations to help clarify what each section meant* *Helped to identify a child's current state of mind and maturity*	*Reducing cluster by increasing font size*

Respondents' feedbacks on the drawing evaluation checklist Appendix G4

27	Anonymous	*It helps us to analyse the child's drawing* *It enables us to understand the child's level of thinking/creativity*	
28	Sue Ema	*It helped us analyse children's drawing however, it is too lengthy and repetitive*	*Shorten it. Focus on the what we are going to analyse.*
29	Anonymous		*Too lengthy* *Too complicated* *Too much description to analyse* *Too much repetition & requires to repeat reading in order to understand* *Simplified the checklist & narrowed the areas that need to be focus*
30	Anonymous		*The font size is too small- clustering* *May like to consider increase font size & spacing* *The space provided for comments could be bigger.*
31	Samantha Sean	*There are examples to help when giving the rating* *Clear categories of the thinking processes that help the evaluator to evaluate the drawing*	*The size of the evidence column to be wider*
32	Jenny Chia Soo Hiah	*It helps me to analyse children drawing more 'in-depth' in more detail & understand how a child sees the world in a different perspective.* *I can see that when the child is exposed to good experiences they are able to express in their drawing in details*	*The remark column be a little wider*
33	Angel & Diyanah	*It is very detailed* *It is easy to use*	
25	Anisah/Janice	*At first three levels, however when we reach the 4th we were a bit confused*	*- there are a lot of ambiguity within each knowledge level* *- each description of the knowledge level seem to be*

Respondents' feedbacks on the drawing evaluation checklist Appendix G4

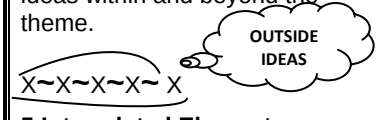
			repetitive *- have a checklist and a section for remarks for each of the knowledge level*
Checklist- very systematic way of exploring the process of thinking; never thought that simple thinking process involve many aspects *Checklist is good- provides examples for each subcategory* *Too wordy; should be simple, straight to the point*			
Make the example more related to the theme *Are the answers & questions meant to be repeated?* *How are we suppose to rate? By the amount of evidence?* *What if they don't show the water cycle but just a little understanding, thus, not much is being shown?*			
Wordy, might want to lessen the words for easy reading			
Some questions are repetitive. Thus answers do not vary. But the session was really interesting. Really! ☺			
In-depth analysis of child's drawing *Very useful* *Very expressive*			

Children's Drawings Evaluation Checklist

Evaluator's Name:		
Date:		Class:
Drawing theme:		
Drawing no:	First drawing ( ) &/or second drawing ( )	
Thematic lesson objectives:	1. 2. 3.	
Target cognitive process:		
Checklist instructions:	1. *Select ONLY one scale from 1 – 5 that best indicates the amount of information represented in the drawing.* 2. *In the rating box that you have selected provide written descriptions as evidence elicited from the drawing to justify your rating.* 3. *In addition, to what was drawn, notes taken from the child's verbal descriptions of their drawings are also counted as evidence.*	
Child's performance:		
1. The child has demonstrated the following cognitive processes & content-knowledge …		
2. As the assessor, I was delighted to discover …		
3. I plan to extend the child's content-knowledge and thinking processes by…		

Adapted from
Anderson & Krathwohl; Airasian, Cruikshank; Mayer; Pintrich; Raths; Whittrock, (2001) Bloom's Taxonomy of Educational Objectives (TEO)

Biggs, J. B. & Collis, K. F. (1982) Evaluating the quality of learning: The SOLO Taxonomy (Structure of the Observed Learning Outcome). Academic Press. New York.

1. REMEMBER		
Recognizing / Recalling/Retrieving by Identifying & labelling things / events / people /objects ***Able to identify and label the elements as seen in drawing and/or in writing and/or verbally:***		
Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>*** of the boxes and provide written descriptions of the drawing evidence to support your rating.**	*a.* ***The names of <u>THINGS</u> (objects / people) represented.*** E.g. *<u>(Things)</u>* "A house", "a tree", "a bus" *<u>(People)</u>* "My mummy", "doctor", "cleaner", "cook".	*b.* ***The names of <u>EVENT</u> (happening activity) represented.*** E.g. *<u>(Event)</u>* "Birthday celebration", "picnic", "concert", "sports competition", "accident", "drowning"
1 **Prestructural** Elements identified and labelled are meaningless and irrelevant to the theme. OR No evidence of cognitive skill demonstrated.	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Identify and label at least one to two simple and obvious elements relevant to the theme. X X **2 Elements**	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Identify and label at least three separate elements relevant to the theme. X X X **3 Separate Elements**	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Identify and label at least four or all related elements by showing relationships in a story-like context presenting a conceptual scheme. X~X~ X~X **4 Relational Elements**	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Identify and label at least five or all the related elements and show their interrelations by introducing ideas within and beyond the theme.  **5 Interrelated Elements**	**The drawing-evidence shows...**	**The drawing-evidence shows...**

2. UNDERSTAND

Interpreting by giving examples to clarify and represent how things (objects / people) function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material (see definitions below)

Able to give examples by drawing:

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating.	*a.* ***How <u>THINGS</u> (objects and people) function or associate with something else*** E.g. (*<u>Objects-association)</u>* The police car is usually drawn in association with an ambulance at the scene of an accident.	*b.* ***How <u>ACTIONS</u> function or associate with something else.*** E.g. *<u>(Action)</u>* The drawing shows ''A little boy *kicking* a ball and it hits the goal posts''.
1 **Prestructural** Examples of function/ association given are meaningless and irrelevant to the theme. OR No evidence of cognitive skill demonstrated.	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Give at least one to two obvious and related examples of function / association relevant to the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Give at least three different examples of function / association relevant to the theme. Child expands on an example with a further description.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Give at least four or all examples of function / association relevant to the theme by showing relationships in a story-like context presenting a conceptual scheme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Give at least five or all examples of function /association and show their interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

2. UNDERSTAND

Classifying by categorizing/subsuming things/events /people/objects according to functions/ placement etc. (see definitions below)

Able to classify by organising and categorizing:

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>*** of the boxes and provide written descriptions of the drawing evidence to support your rating.**	**c. ***<u>THINGS</u>* ***(objects/people) according to functions / purposes / gender /relationships / occupations.*** E.g. *<u>(People)</u>* grouping doctors, nurses, ambulance attendants (health care); daddy is taller than mummy and mummy is taller than the child (family relationships).	**d. ***<u>EVENTS</u>* ***according to occasions / causes in the drawing.*** E.g. *<u>(Other Events)</u>* School sports day, a rain storm, school concert, accident, Tsunami, zoo outing.
1 **Prestructural** Elements classified are meaningless and isolated. OR No evidence of cognitive skill demonstrated.	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Classify at least one to two elements by organizing and categorizing them according to obvious and related characteristics.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Classify at least three elements by organizing and categorising them according to each individual characteristic. Child expands on an element with a further description	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Classify at least four or all of the related elements by organising and categorising them to show relationships in a story-like context presenting a conceptual scheme	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Classify at least five or all the related elements by organising and categorising them to show their interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

2. UNDERSTAND

Inferring by comparing, explaining, predicting, concluding the causal-effect of things /events / people / objects (see definitions below)

Able to conclude / predict understanding by comparing and explaining the causal-effect of:

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating.	**e. *<u>THINGS</u> (objects / people) drawn.*** E.g. *(People)* The policeman chased the bad guy (effect) because the bad guy damaged the car (cause)	**f. *<u>EVENTS</u> (happening activity) in the drawing.*** E.g.*(Event - Fighting*) ''The two men were fighting because they wanted to take the same seat he refused to share so he punched his eye blue-black''.
1 **Prestructural** Elements inferred by comparing and explaining are meaningless and isolated. OR No evidence of cognitive skill demonstrated.	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Infer by comparing and explaining the obvious causal-effect of at least one to two elements represented.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Infer by comparing and explaining the causal-effect of at least three elements represented. Child expands on an element with a further description.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Infer by comparing and explaining the causal-effect relationships of at least four elements represented in a story-like context presenting a conceptual scheme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Infer by comparing and explaining at least five elements' causal-effect interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

3. APPLY

Executing (carrying out) & implementing (using) a procedure to determine what/where/how/when/why - Things /objects / people /events come from & where it goes *(see definitions below)*

Execute in drawing a procedure to determine what / where / how / when / why:

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating.	***a. <u>THINGS</u> (objects/people) come from and where it goes in the process.*** E.g. The child drew and explained "The bird flies, flies to the mountain and disappears into the clouds because it is a special bird".	***b. <u>EVENTS</u> the sequence of something that happens and its outcome.*** E.g. *(Event)* Accident, concert, injury, sports competition OR life-cycle sequence of insects, animals.
1 **Prestructural** Apply by determining the element(s)' procedure is meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Apply by determining at least one to two related elements' procedure of where it comes from and where it goes.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Apply by determining at least three elements' different procedures of where each element comes from and where it goes.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Apply by determining at least four or all of the related elements' procedure to show the relationships of where the elements come from and where they go in a story-like context presenting a conceptual scheme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Apply by determining at least five or all the related elements' procedure to show interrelations of where the elements come from and where they go by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

4 ANALYZE		
Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*		
Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating. (See Analyze for each (a), (b), & (c) specification).	***a. Differentiating people / events; things / objects by distinguishing / selecting relevant from irrelevant parts of the presented material*** E.g. *<u>(Relevant from Irrelevant parts)</u>* The child is able to differentiate by drawing things such as wiper, mirror, and steering wheel belonging to a car and not an aeroplane.	***b. Attributing people/events; things/objects by deconstructing to determine a point of view, bias, values, or intent underlying the situation*** E.g. *<u>(Intent)</u>* The child determined an underlying intent "The lion wants to attack the cobra because he is hungry"
1 **Prestructural** Elements analyzed are meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Analyze at least one to two related elements by differentiating *or* attributing *or* organizing respectively. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Analyze at least three elements by differentiating *or* attributing *or* organizing respectively. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Analyze at least four or all of the related elements by differentiating *or* attributing *or* organizing to show relationships in a story-like context presenting a conceptual scheme	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Analyze at least five or all the related elements by differentiating *or* attributing *or* organizing to show interrelations by introducing ideas within and beyond the theme. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**	**The drawing-evidence shows...**

4 ANALYZE

Differentiating by identifying things /events/ people/objects and organizing & attributing into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating.	***c. Organizing* people/events; things/objects by finding coherence and structuring how elements fit or function within a structure/situation** E.g. The child organized elements of a birthday party by drawing balloons, cake, presents, food, streamers, people showing how these elements relate to one another to give an over-all meaning of a birthday party in the drawing.
1 **Prestructural** Elements analyzed are meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Analyze at least one to two related elements by differentiating *or* attributing *or* organizing respectively. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**
3 **Multistructural** Analyze at least three elements by differentiating *or* attributing *or* organizing respectively. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**
4 **Relational** Analyze at least four or all of the related elements by differentiating *or* attributing *or* organizing to show relationships in a story-like context presenting a conceptual scheme (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**
5 **Extended Abstract** Analyze at least five or all the related elements by differentiating *or* attributing *or* organizing to show interrelations by introducing ideas within and beyond the theme. (See Analyze for each (a), (b), & (c) specification).	**The drawing-evidence shows...**

5. EVALUATE

Make judgments based on <u>criteria</u> and standards (from such evidence as logical accuracy, consistency and other internal or external criteria or the ability to indicate logical fallacies in arguments {detecting humour in drawing}) as determined by the child or those which are given to the child by adults *(see definitions below)*

Select only <u>ONE</u> scale ranging from 1 to 5 in *<u>one</u>* of the boxes and provide written descriptions of the drawing evidence to support your rating.	***a. Checking* by drawing to determine things based on criteria or standards** E.g. *(<u>Criteria</u>* of an 'angry' lion with sharp teeth, attacks other animals, angry eyes, sharp claws) The child drew an angry lion to determine concepts of prey and predator.	***b. Critique* by judging and detecting inconsistencies** E.g. (Detecting false idea/humour) "The man wears high heels and goes to work in the office'' (the child giggled and laughed at the idea)
1 **Prestructural** Elements evaluated are meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Evaluate at least one to two related elements based on criteria to judge whether it is logical or illogical OR to detect false idea as in humour.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Evaluate at least three elements based on criteria to judge whether it is logical or illogical OR to detect false idea as in humour.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Evaluate at least four or all of the related elements based on criteria to judge whether it is logical or illogical or to detect false idea in humour. To show relationships in a story-like context presenting a conceptual scheme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Evaluate at least five or all the related elements based on criteria to judge whether it is logical or illogical or to detect false idea as in humour and show interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

6. CREATE

Generate by planning & producing by putting elements (things/events/ people/objects) together to form a ***new pattern or structure*** of a connected whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

Select only <u>ONE</u> scale ranging from 1 to 5 in <u>*one*</u> of the boxes and provide written descriptions of the drawing evidence to support your rating.	***a. Generate* by coming up with different ideas based on criteria/standards to describe an observed situation in drawing.** E.g. *<u>(Different idea)</u>* "The man is scared and never eat that's why he is drowning" instead of the usual assumption – "because the water current is too strong and cold to account for the cause of drowning".
1 **Prestructural** Elements created are meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Create at least one to two new elements by generating OR planning OR producing (See Create for each (a), (b), (c) specifications).	**The drawing-evidence shows...**
3 **Multistructural** Create at least three new elements by generating OR planning OR producing (See Create for each (a), (b), (c) specifications).	**The drawing-evidence shows...**
4 **Relational** Create at least four or all new elements by generating OR planning OR producing showing novel relationships presenting a new conceptual scheme.	**The drawing-evidence shows...**
5 **Extended Abstract** Create at least five or all new elements by generating OR planning OR producing to show novel interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**

6. CREATE

Generate by planning & producing by putting elements (things/events/ people/objects) together to form a
new pattern or structure or a connected whole by arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

Select only ONE scale ranging from 1 to 5 in *one* of the boxes and provide written descriptions of the drawing evidence to support your rating.	***b. Plan* by designing a procedure to carry out an activity in drawing.** E.g. The child designed by drawing an electrical pathway to track how light bulbs were lighted up on a tree using many winding lines for wires joined to little stars.	***c. Produce* by constructing or inventing in drawing a new model or product.** E.g. A flying house (a pair of wings attached to a house creating a new house model)
1 **Prestructural** Elements created are meaningless and isolated. OR No evidence of cognitive skill demonstrated	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**	**Indicate "No evidence" if nothing is demonstrated or indicate "Irrelevant" by describing what was meaningless.**
2 **Unistructural** Create at least one to two new elements by generating OR planning OR producing (See Create for each (a), (b), (c) specifications).	**The drawing-evidence shows...**	**The drawing-evidence shows...**
3 **Multistructural** Create at least three new elements by generating OR planning OR producing (See Create for each (a), (b), (c) specifications).	**The drawing-evidence shows...**	**The drawing-evidence shows...**
4 **Relational** Create at least four or all new elements by generating OR planning OR producing showing novel relationships presenting a new conceptual scheme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**
5 **Extended Abstract** Create at least five or all new elements by generating OR planning OR producing to show novel interrelations by introducing ideas within and beyond the theme.	**The drawing-evidence shows...**	**The drawing-evidence shows...**

Name: _____ ____ Designation_____ _____

Class Drawing Evaluation Checklist Cognitive Processes & Content-knowledge

Date_____ Class_____

Child's Name	*SOLO*	*COGNITIVE PROCESSES*														
Select only ONE scale and tick accordingly		Remember		Understand			Apply	Analyze			Evaluate		Create		
Prestructural (P1) Unistructural (U2) Multistructural (M3) Relational (R4) Extended Abstract (E5)		Identify	Label	interpret	Classify	Infer	Knowledge of Procedure	Differentiate	Attribute	Organize	Check	Critique	Generate	Plan	Produce
	P1														
	U2														
	M3														
DOB:	R4														
Date:	E5														
	P1														
	U2														
	M3														
DOB:	R4														
Date:	E5														
	P1														
	U2														
	M3														
DOB:	R4														
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	U2														
	M3														
DOB:	R4														
Date:	E5														
	P1														
	U2														
	M3														
DOB:	R4														
Date:	E5														

Evaluator's Name_____ Designation_____

Accelerated Children's Drawing Evaluation Checklist
Cognitive processes & Content-knowledge

Child's Name_____
DOB_____ Date_____ Class_____

Bloom's Cognitive Processes	***SOLO – Amount of information recorded in the drawing***				
Select only ONE scale and support with written descriptions as seen in the drawing in ONE of the boxes.	***1*** **Prestructural** Elements are disconnected and irrelevant. OR No evidence of cognitive skill demonstrated.	***2*** **Unistructural** Present only one to two simple and obvious relevant elements. X X **2 Elements**	***3*** **Multistructural** Present at least three or more separate relevant elements. X X X **3 Separate Elements**	***4*** **Relational** Able to show relationships between relevant elements in a meaningful context. X~X~ X~X **4 Relational Elements**	***5*** **Extended Abstract** Able to interrelate by linking up all the elements. Sometimes introduce outside ideas to explain their interrelationships. X~X~X~X~ X OUTSIDE IDEAS **5 Interrelated Elements**
1. REMEMBER	***Recognise by identifying and labelling the elements in the drawing (verbally or/and in writing):***				
a. ***Identify & label the names of <u>THINGS</u> (objects / people)***					
b. ***Identify & label the names of <u>EVENT</u> (happening activity)***					
2. UNDERSTAND ***<u>Interpret</u>*** *by giving examples*	***Interpreting*** **by giving examples** to clarify and represent how things (objects / people) function or associate with something else. It may involve a reordering, rearrangement, or a new view of the material (see definitions below)				
a. ***How <u>THINGS</u> (objects and people) function or associate with something else.***					
b. ***How <u>ACTIONS</u> function or associate with something else.***					

Classify *by organising and categorizing:*	***Classifying*** by categorizing/subsuming things/events /people/objects according to functions/ placement etc. (see definitions below)				
c. ***THINGS (objects/people) according to functions / occupations / gender /relationships.***					
d. ***EVENTS according to occasions / causes***					
Infer *by comparing and explaining the causal-effect:*	***Inferring*** by comparing, explaining, predicting, concluding the causal-effect of things /events / people / objects (see definitions below)				
e. THINGS (objects / people) drawn.					
f. ***EVENTS (happening activity) in the drawing.***					
3. APPLY ***Execute*** ***a procedure to determine what / where / how / when / why:***	***Executing*** (carrying out) & implementing (using) a procedure to determine what/where/how/when/why - Things /objects / people /events come from & where it goes *(see definitions below)*				
a. THINGS (objects/people) come from and where it goes in the process.					
b. EVENTS the sequence of something that happens and its outcome.					

4. ANALYZE ***people/events; things/objects***	***Differentiating*** by identifying things /events/ people/objects and ***attributing*** & ***organizing*** into form and pattern how parts relate to one another and to an over-all structure or purpose *(see definitions below)*				
a. Differentiate by distinguishing relevant from irrelevant					
b. Attribute by determining a point of view, bias, values, or intent underlying the situation.					
c. Organize by finding coherence and structuring how elements fit or function within a structure/situation.					
5. EVALUATE based on ***criteria***	***Make judgments*** by ***checking and critiquing*** based on ***criteria*** and standards (to detect whether an idea is logical or illogical, accurate or inaccurate, consistent or inconsistent e.g. child illustrates humorous ideas)				
a. Checking by drawing to determine things based on criteria or standards.					
b. Critique by judging and detecting inconsistencies (humour in drawing) and appropriateness of a procedure/behaviour in a situation.					

6. CREATE	***Generate*** by ***planning*** & ***producing*** by putting elements (things/events/ people/objects) together to form a ***new pattern or structure*** of a connected whole by arranging and combining them in such a way as to constitute an original pattern or structure not clearly there before.				
a. Generate by coming up with alternative explanations based on criteria/standards to explain an observed situation in drawing.					
b. Plan by designing a procedure to carry out an activity in drawing.					
c. Produce by constructing or inventing in drawing a new model or product.					

Child's overall performance:

Respondents' feedback on the revised Bloom-SOLO checklist July 2012
My Feedback
I think the checklist was useful...
In helping me to evaluate children's drawings and to understand their thoughts and thinking process, also their drawing developmental level *Beginning part quite relevant and easy to understand and later part a little confusing about interrelations for first timer.* *Checklist is good/useful to gauge children's drawings, to understand and their feelings* *Good for detailed assessments on child's drawings* *Examples given were in details. Makes it easier for first timers to refer to.* *The checklist helped to assess the child's drawing according to a set of criteria which was specific and structured* *It helps me to tell how much child knows about pertaining to a subject. It also tells teachers how critically the child thinks; this can help teachers to plan the curriculum from here as she will know what she needs to cover and which she need not.* *The indication of Bloom's cognitive processes on each page helped me to understand what is required. The examples given are also helpful. The portrait format is great. Easy on the eye.* *Because there are only 2 questions -on each page it is easier to read, understand. The examples are very necessary.* *To help me figure out what to look out for in children's thinking. Think about how to extend children's thinking.* *To analyse a child's artwork; it makes you really think of what the child might be thinking* *Yes it allowed me to analyse and look at the children's drawings using different criteria* *As it makes me go thought the thinking process of evaluating analyzing in a systematic way. The examples given were helpful especially when I am in doubt.* *It gives me more specifications to go down to the core details of the expressions* *It helps me in understanding children's drawing on how well do they understand the concept* *In helping me to evaluate children's drawing and to understand their thoughts and thinking process. Also their drawing developmental level (SiNI 5 July 2012)*

I Think the checklist could be improved in the following areas ...

Include a check box and one number to a page

'Create' part is difficult to associate with the drawing. Simplified the examples for 'create'. Use simple words e.g. 'reasons' for hypotheses.

Description and explanation of each grading criteria

Need to think of the accuracy of the checklist e.g. at least how many assessment before a conclusion is made

Large boxes to fill up the evidence

Several areas were unclear and difficult to place in either category – perhaps a range could be provided (e.g. 3-4 rather than just one category)

I need to digest it than I can suggest for improvements

Keep the Bloom's cognitive processes – remove the descriptions e.g. " Recalling, retrieving..." move the instructions "able to identify to the top"

First page – Rhinoceros – small letter; reduce the bold, capitalization, underlined words in the questions – perhaps just one of these highlight to indicate the most important to look out for/ similar to the double-lines of boxes/table; state somewhere we are to write "No evidence" in instructions

Scale more direct, a little less wordy; the overlapping of the different categories can feel quite uncertain in terms of what we are looking out for.

Point form instead of wordy.

I'm unable to think of at the moment but checklists are usually of the same structure.

Some of the points can be merged together.

Try to make the questions easier and having the SOLO rating in pictorial helps me in referring to the rating

Include a check box and one number to a page (SiNI 5 July 2012)

My overall rating experience was ...

Awesome

Checklist overall was ok except under Evaluation could be simpler.

Learning, discovering, exploring and concluding

Such checklist should be implemented to explain children's drawings

Good! It helped me to think through the areas of cognitive sill in relation to the child's drawing. It was clear and easy to use.

I am aware that I need time to digest. Practice will make me get the hang of it. This is definitely a useful tool for teachers

I'm more satisfied now than I did with the first round of checklist.

The survey takes time to do and we need to think about what we are commenting on which is a positive things as it makes us to think and analyse. At the same time it focuses our analysis so that we do not think randomly.

It's good helps to really evaluate the children's thought processes.

It's actually very good, it's good that there's a drawing evaluation to evaluate children's artwork; let' you realise how a child thinks

Enjoyable/enlightening

Useful as the checklist make me think more in-depth when going through the checklist
Very interesting but a bit time taking

It was much better to do compare to the previous one.

Awesome (SiNI, 5 July 2012)

SPASTIC 20 Respondents' feedback on the revised Bloom-SOLO checklist 24 Aug 2012
My Feedback

I think the checklist was useful...

- *It is a useful framework. A starting point for us to "analyze" the drawings*
- *Precise explanation given*
- *Examples are given; helps the assessor to draw out certain details that he/she might not notice*
- *It helps break down the analysis of children's drawings into steps; easy to organise thoughts*
- *Yes, it is useful as it really makes you look at the drawing as a mirror of the child's intent and thoughts*
- *Allows me to understand the drawing and what is going on in my child's mind*
- *In that the teachers can apply and refer as guide for their lesson planning, intervention, strategies etc. Catering to the individual needs of their students*
- *The checklist is very good to help me know how to categorise their thinking; to stir me to promote higher level of learning/thinking; to appreciate the drawings and use them more effectively for their growth*
- *Explanation and examples of criteria is given*
- *The checklist was useful because there are examples given*
- *Reflecting on the development of the child through drawing*
- *It really make you think and try to analyse what we might overlooked when looking at child's drawing*
- *Yes.*
- *It's very detailed and provides a guide to analyse the drawing*
- *Yes.*
- *For analysing children's artwork; able to provide parents a better POV of their children's work*
- *In interpreting the children's cognitive level*
- *The checklist was useful because it helps us indentify the things that needs to be analyzed*

and understand in the children's drawings

- *But needs a lot of time to practice and analyze*

I Think the checklist could be improved in the following areas ...

- *Simplify further? Too many points/notes to read through. Gets a bit confusing.*
- *No comments*
- *Pictures as illustrated on the first page of checklist X~X~X (excellent understanding) if the rest of the checklist could have this pictorial helps.*
- *There is some overlap in the answers – repetition; could be simpler, maybe can combine things/events*
- *No comments*
- *Less repetitive*
- *Have two versions (lengthy & simplified); current version is too lengthy*
- *Add more illustrations*
- *Should be more specific and detailed*

My overall rating experience was ...

- *An eye-opener. There are more things than meets the eye in terms of drawing*
- *First time attending "Reading a child's drawing..." helps a bit in looking and interpreting child's drawing and future needs in lesson planning.*
- *Good – gives me a different perspective when looking at children's drawing*
- *Good. It was interesting and made me analyse what the child actually wanted to put across to the person looking at the drawing*
- *It was really good and a total different experience and perspective over children's drawings*
- *Enriching for me and expand my knowledge of interpreting children's thoughts.*
- *Got to try a few more times to master the skills of assessing children's artwork*
- *I think I would need a little more workshop so that I would be able to read the children's*

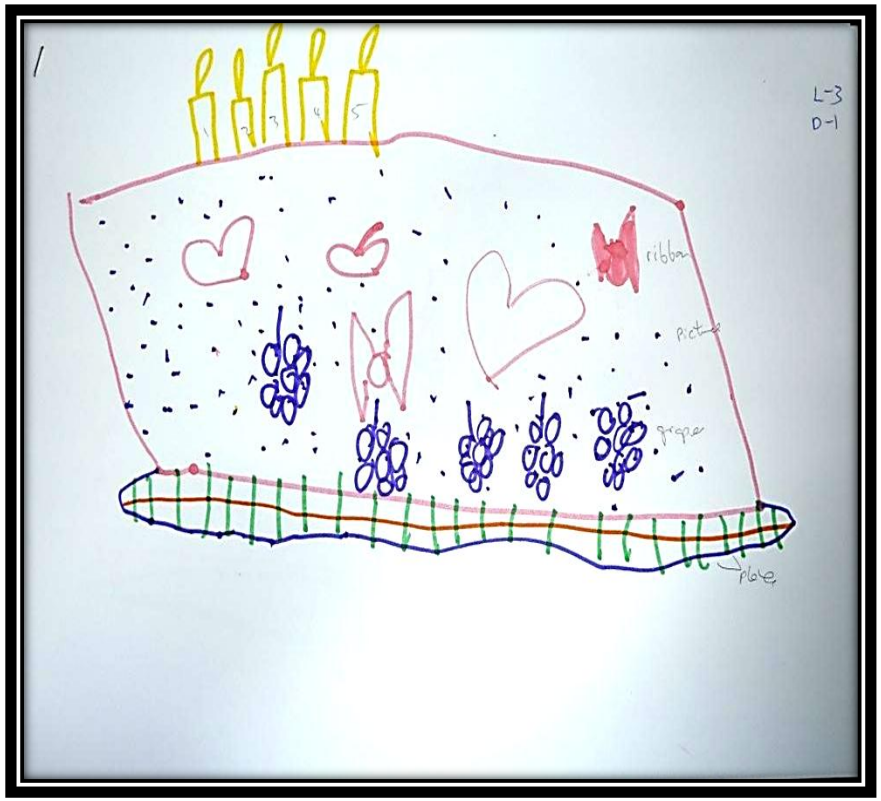
drawings better

- *I think it will be easier if we knew the child whose drawings we are looking at.*
- *Good. Need to...how to develop the drawing skills for low functioning skill and non-verbal students*
- *It can be a bit confusing and overwhelming for first time user*
- *Interesting*
- *Very good. Its an eye opener to look through children's drawing to understand what is in their mind*
- *Interesting /useful*
- *Interesting; a nice breather for the teachers*
- *Good.*
- *Highly satisfactory. The topic is interesting*
- *OK but I want more time to learn more. More training and more time because 3 hours not enough to understand and to absorb everything.*

Structure of Learning Outcomes (SOLO)

Rating Response Measures

Structure of Learning Outcomes (SOLO) Rating Response Measures



Prestructural

1

Elements identified and labelled are

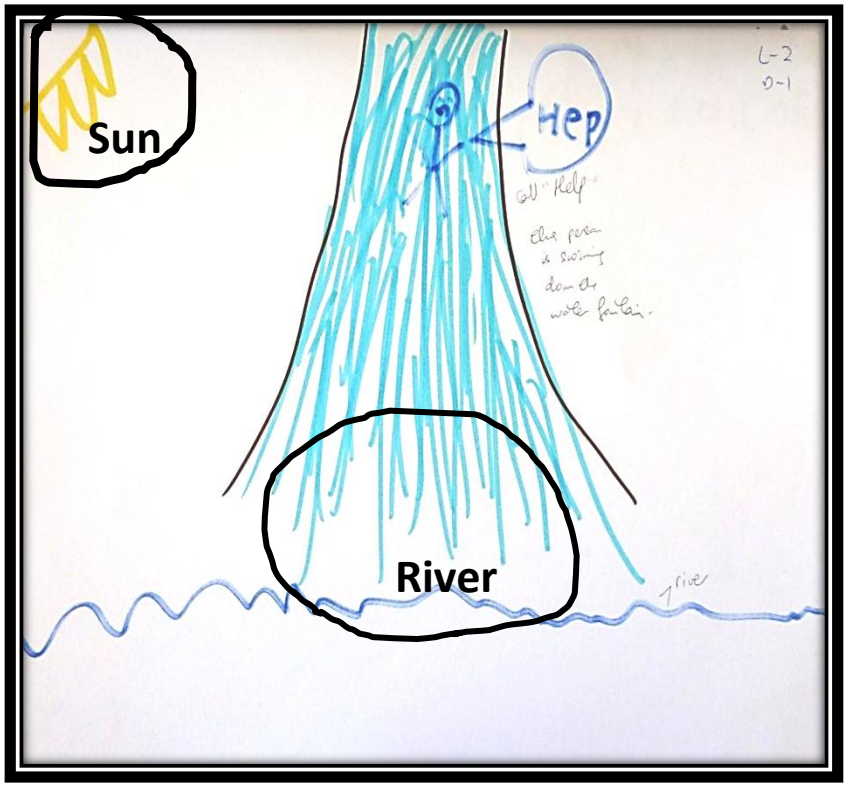
meaningless and ***irrelevant*** to the theme

e.g. A birthday cake is irrelevant to wild animals or water cycle theme.

OR

No evidence of cognitive skill demonstrated.

Water Cycle Theme



Unistructural

2

Identify and label at least

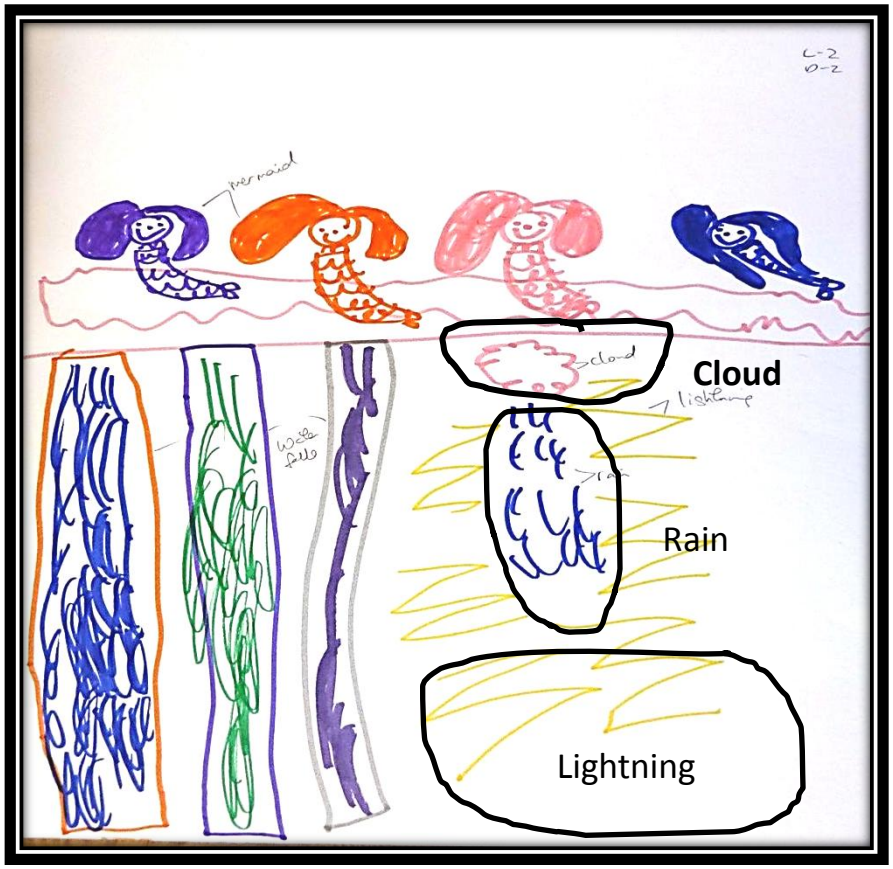
one to two simple and obvious elements

relevant to the theme.

X X

2 Elements

Water Cycle Theme



Multistructural

3

Identify and label at least ***three*** separate elements ***relevant*** to the theme.

X X X

3 Separate Elements

Water Cycle Theme

4 elements showing Relationships

Relational

4

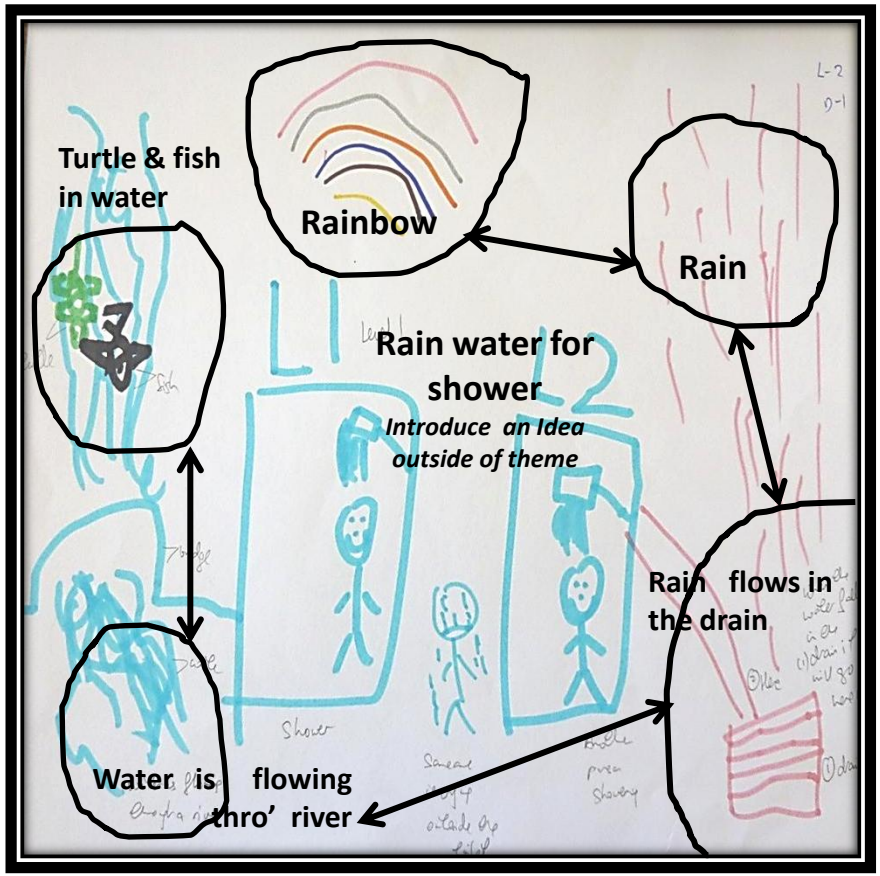
Identify and label at least

four or all related elements by showing ***relationships*** in a story-like context presenting a conceptual scheme.

X~X~ X~X

4 Relational Elements

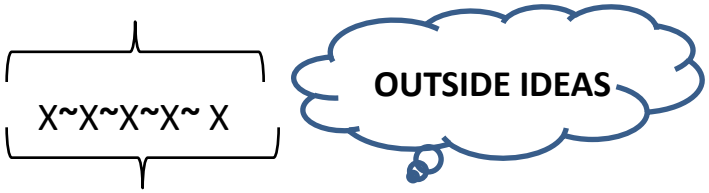
Water Cycle Theme



Extended Abstract

5

Identify and label at least ***five or all*** the related elements and show their ***interrelations*** by introducing ***ideas within and beyond the theme.***



5 Interrelated Elements

Children's Drawings Analysis (children with special needs)

By Rebecca Chan

17 child-artists with special needs (5-6 years old)

34 Drawings

Drawing Themes

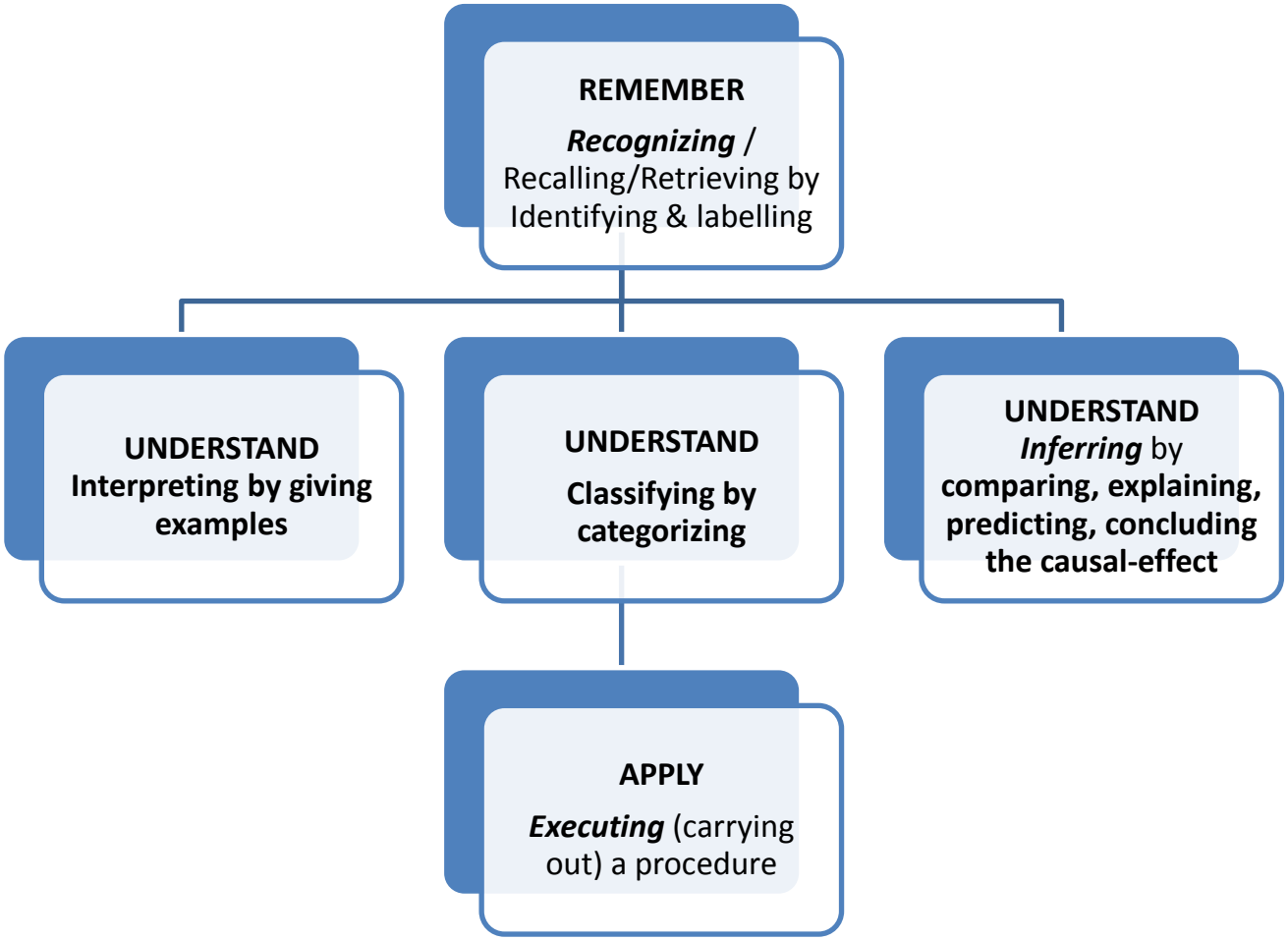
Drawing Themes

1. **How do you come to school everyday**
2. **Things in a classroom**
3. **National day**
4. **Friends in the school (Racial harmony day)**
5. **What you like to do in school**
6. **Number-story**

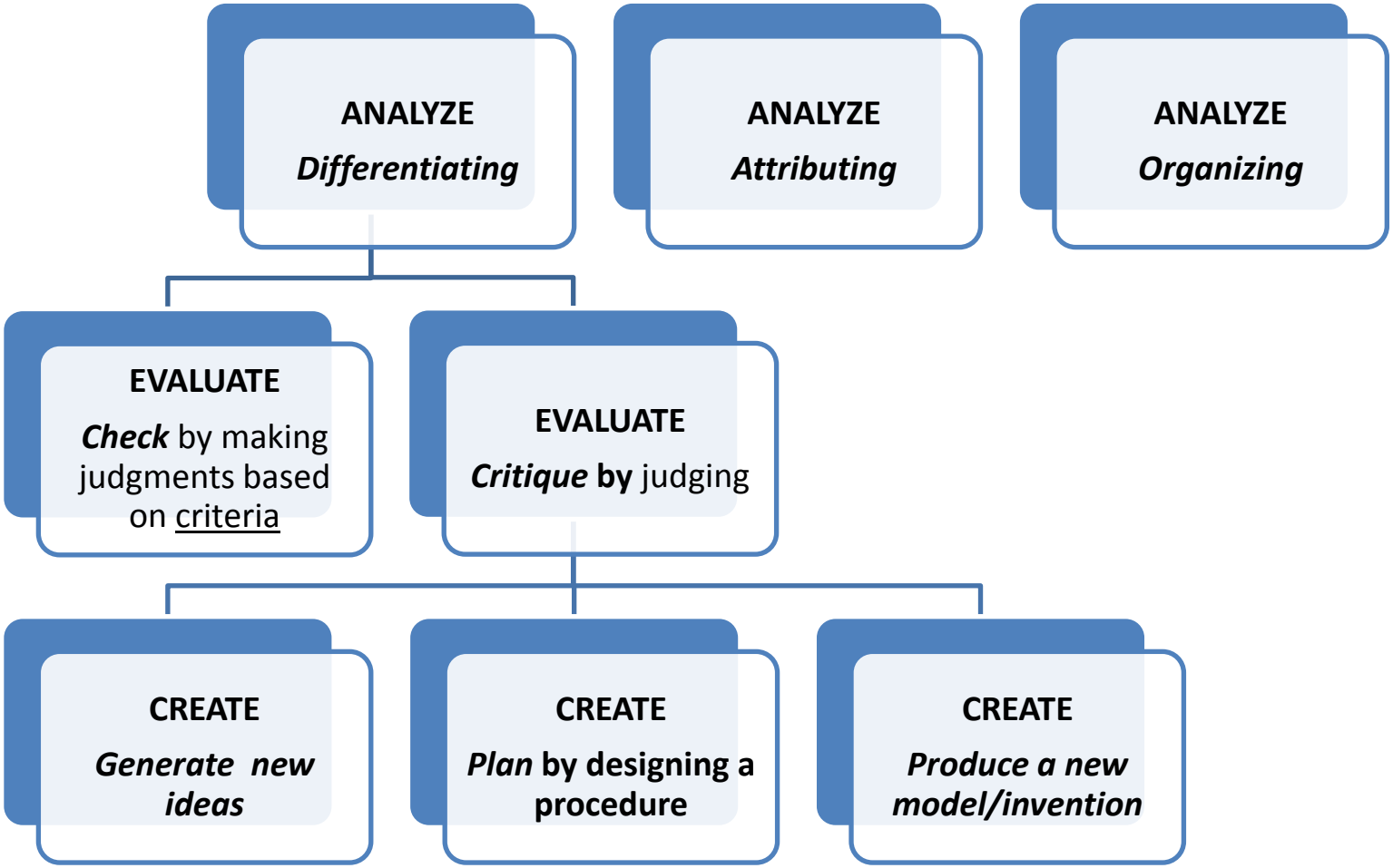
Special Needs Domain

- Global Developmental Delay (GDD)
- Speech delay
- Autism Spectrum Disorder (ASD)
- Asperger

Bloom's 6 Cognitive Process



Bloom's 6 Cognitive Process



Things in the classroom
D2 H.

1. REMEMBER

Able to identify and label the names of THINGS represented:

- Fan
- Door
- Dustbin

2. UNDERSTAND

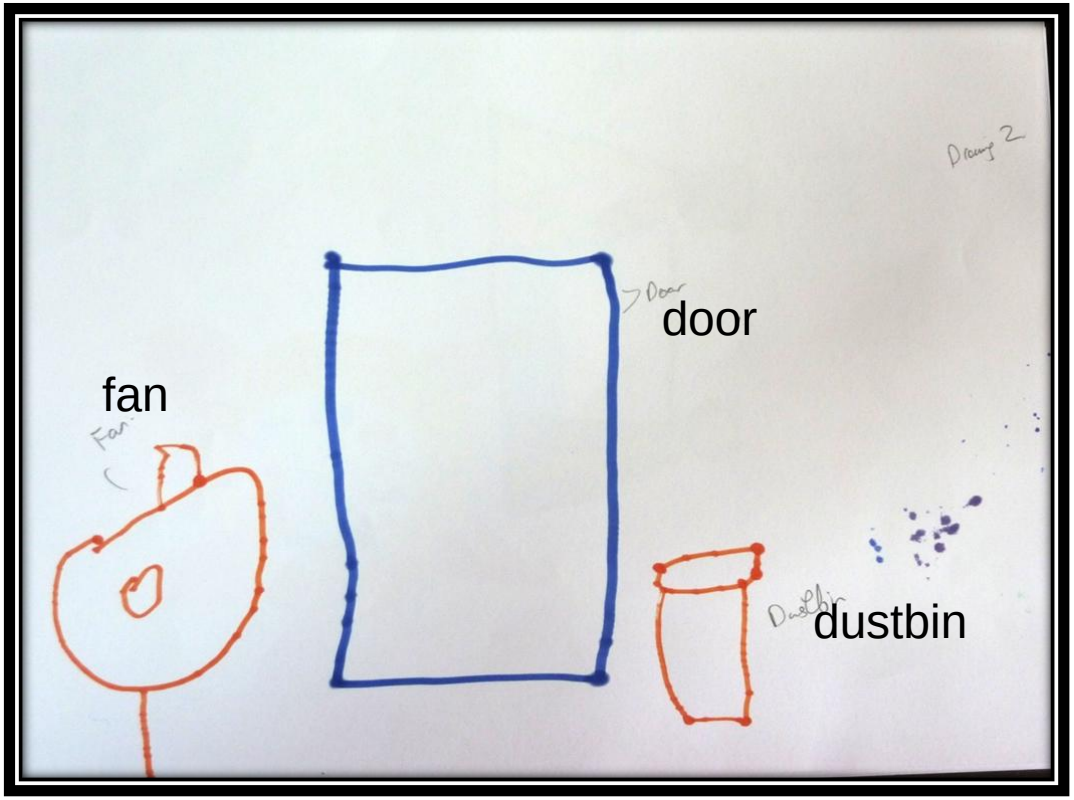
•***Classify*** *by organising and categorizing*

THINGS according to functions / purposes

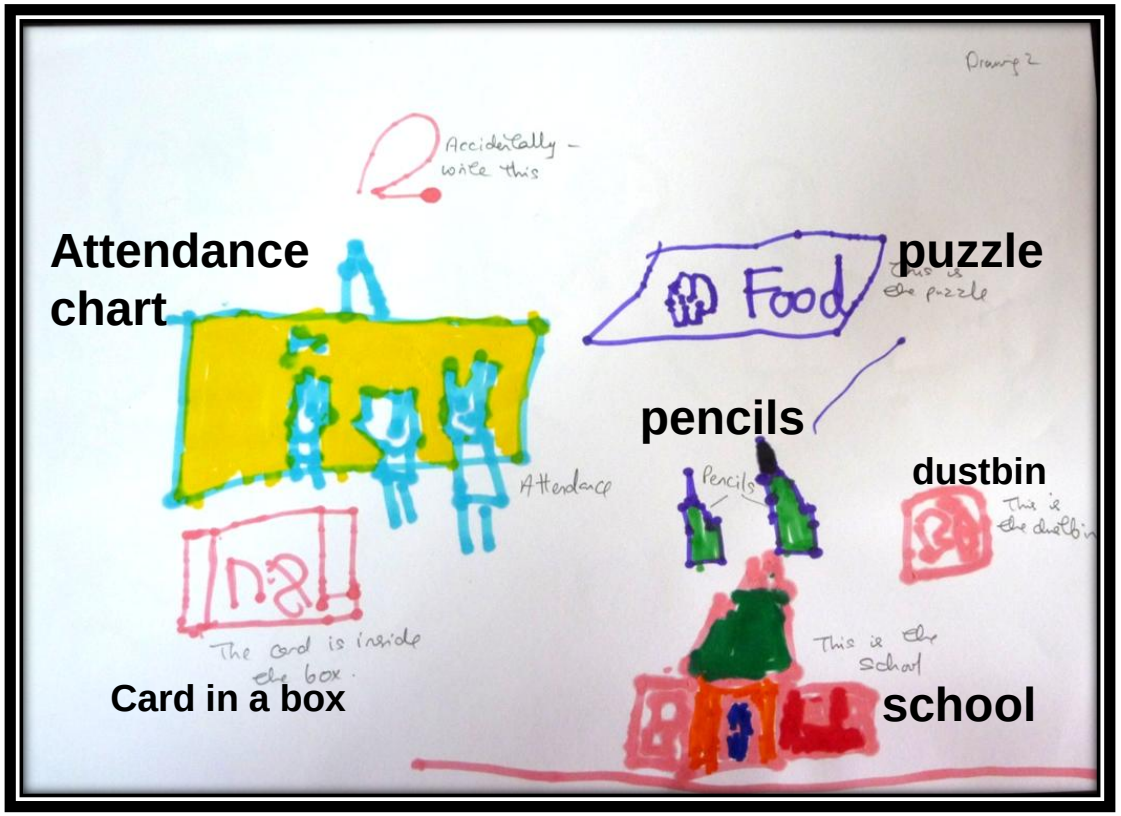
4. ANALYZE

•***Differentiating*** *things by distinguishing / selecting relevant from irrelevant parts of the presented material*

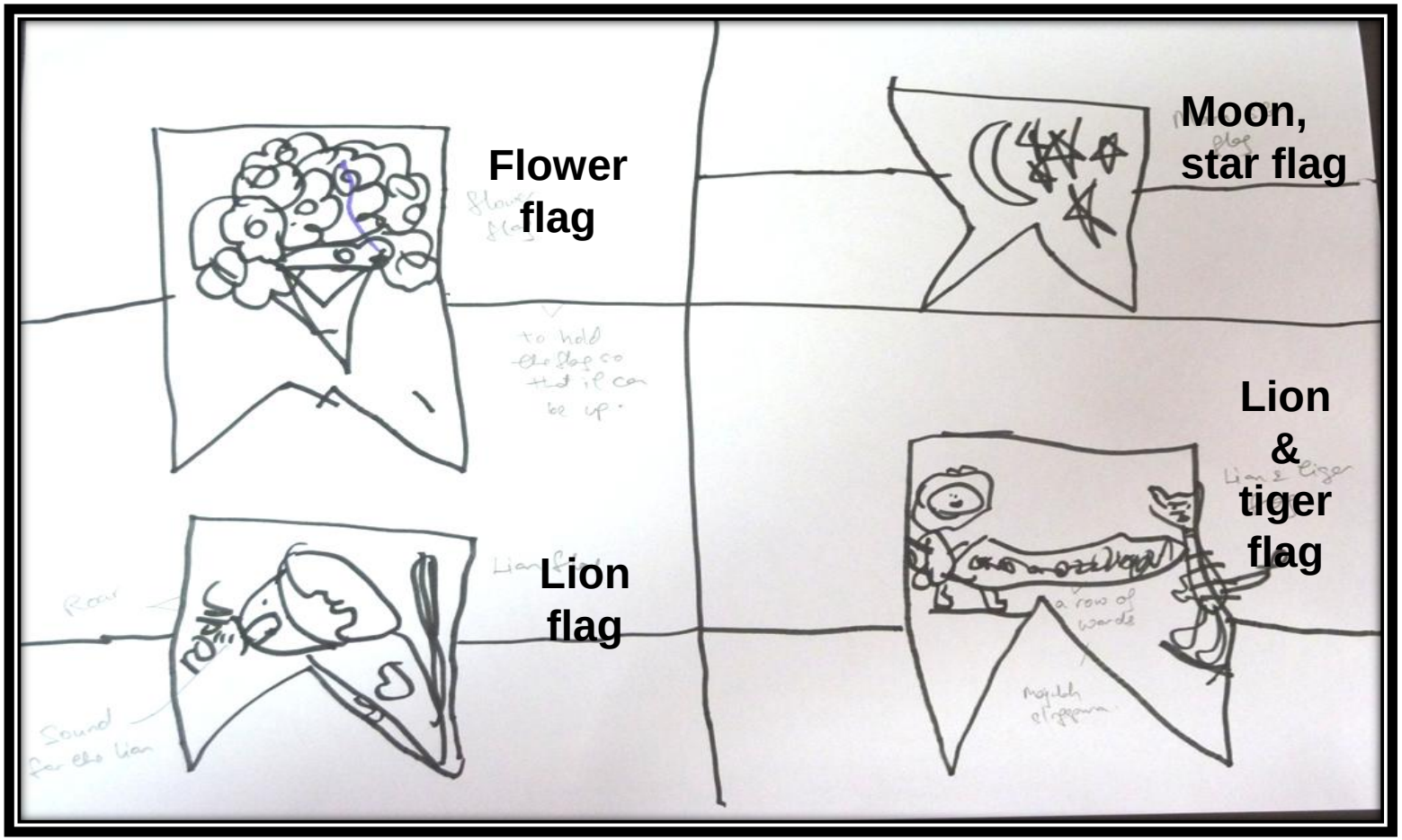
•***Organizing*** *things by finding coherence and structuring how elements fit or function within a structure*



Things in the classroom



National Day



National Day
D 2

1. <u>REMEMBER</u>

Able to identify and label the names of <u>THINGS</u> represented:

• colour concepts: orange, purple, red, brown, green coloured lines

Friends in school

6 Cognitive Processes

2. **UNDERSTAND** – why?

a. *Interpretation* by giving examples

b. *Classifying* by organizing/categorizing/ grouping

- Things/objects
- Events/experiences
- People/gender, functions, relationships

c. *Inferring* by

- Comparing, explaining, predicting
- Causal-effect relations

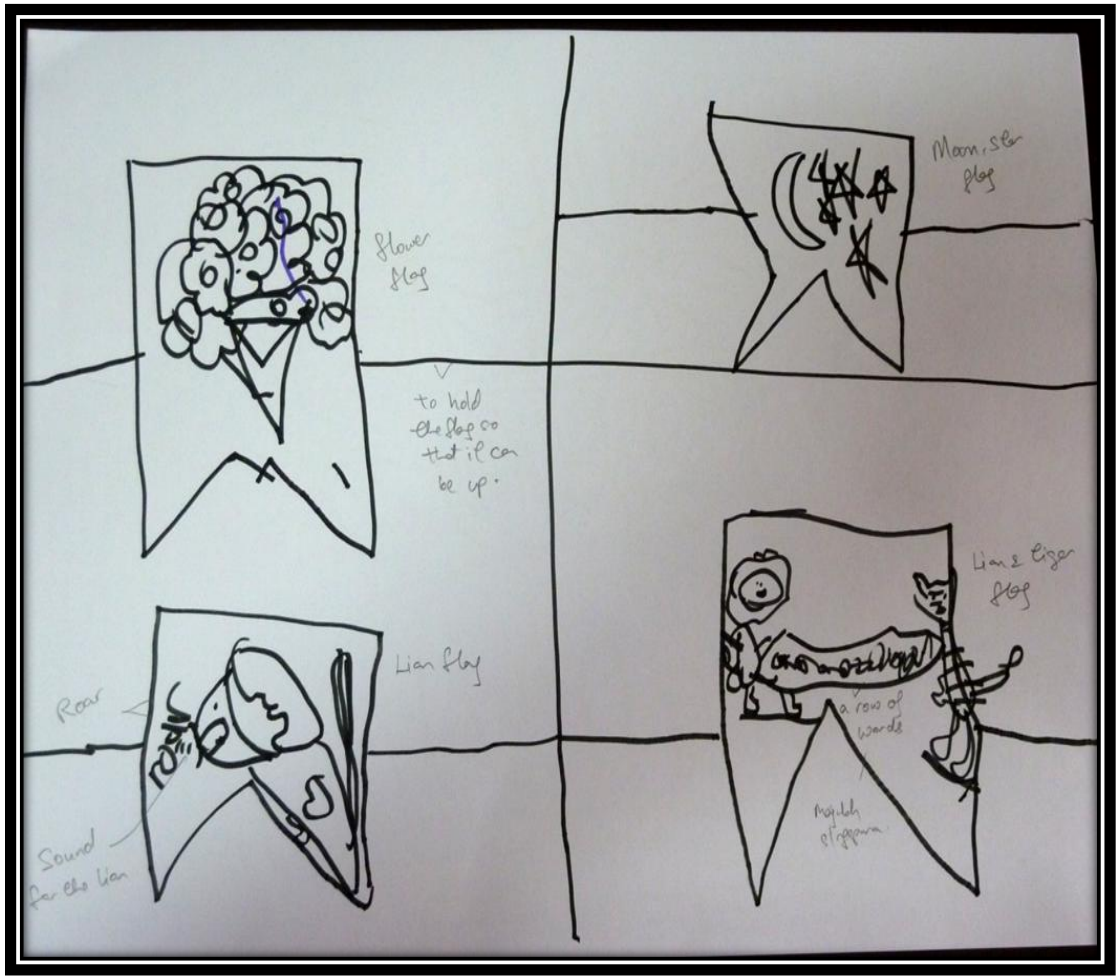
Cognitive Process: Understand

1. **Interpreting**

- Give example of lion “Roar”

2. **Classify**

- Grouping flags



What I like to do in School
D2 S. K.

1. REMEMBER

Able to identify and label the names of THINGS represented.

• “playing blocks”

• Coloured blocks – purple, pink, black, brown, white, dark green, red, dark blue, blue, yellow”

2. UNDERSTAND

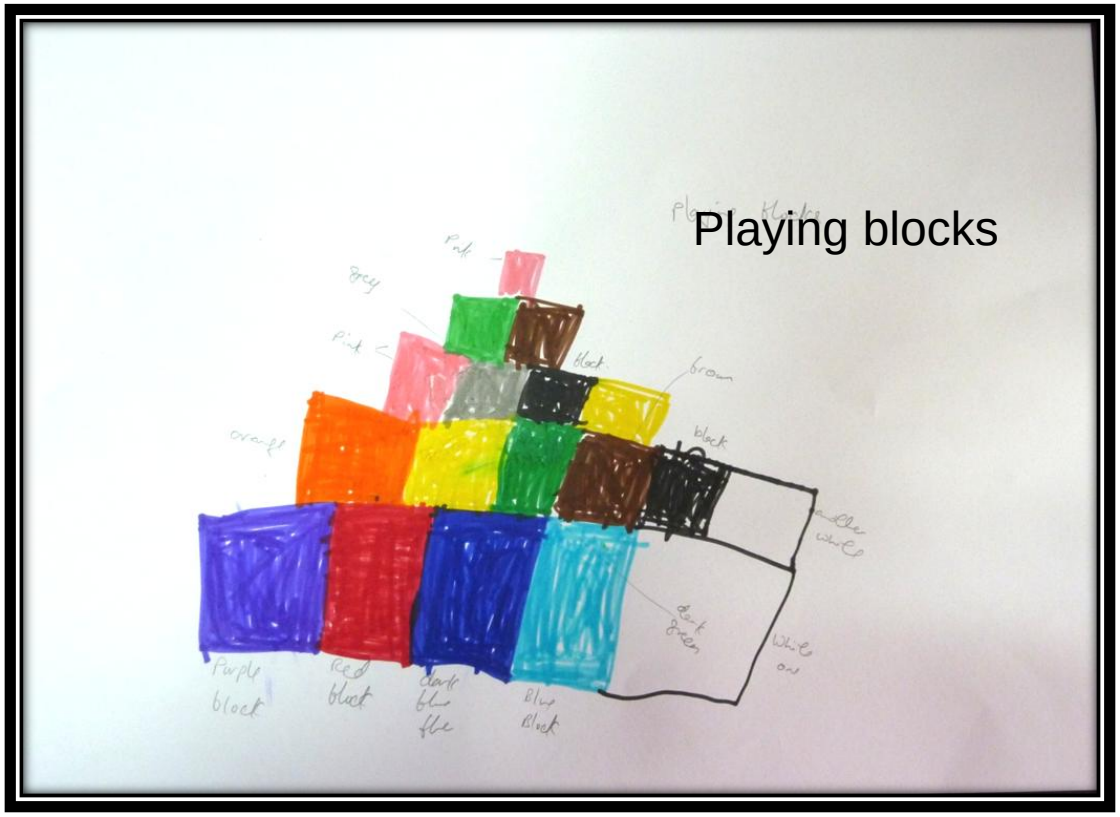
Classify by organising and categorizing

• “play blocks”

4. ANALYZE

Organizing people by finding coherence and structuring:

• Blocks = square/cube; stack up like a pyramid



Things in a classroom
D2 W.

1. REMEMBER

Able to identify and label the names of THINGS represented:

• whiteboard – fun things, 3 toilets (teacher, boy & girl), school bus no 3, primary school

2. UNDERSTAND

Interpret by giving examples &

Classify by organising and categorizing people occupations:

• *boy never bring bag cannot go to school, toilet (teacher, boy & girl), children; baby school vs primary school*

•***Inferring* by explaining,** "never bring bag cannot go to school"

3. APPLY

People come from and where it goes in the process.

Pathways:

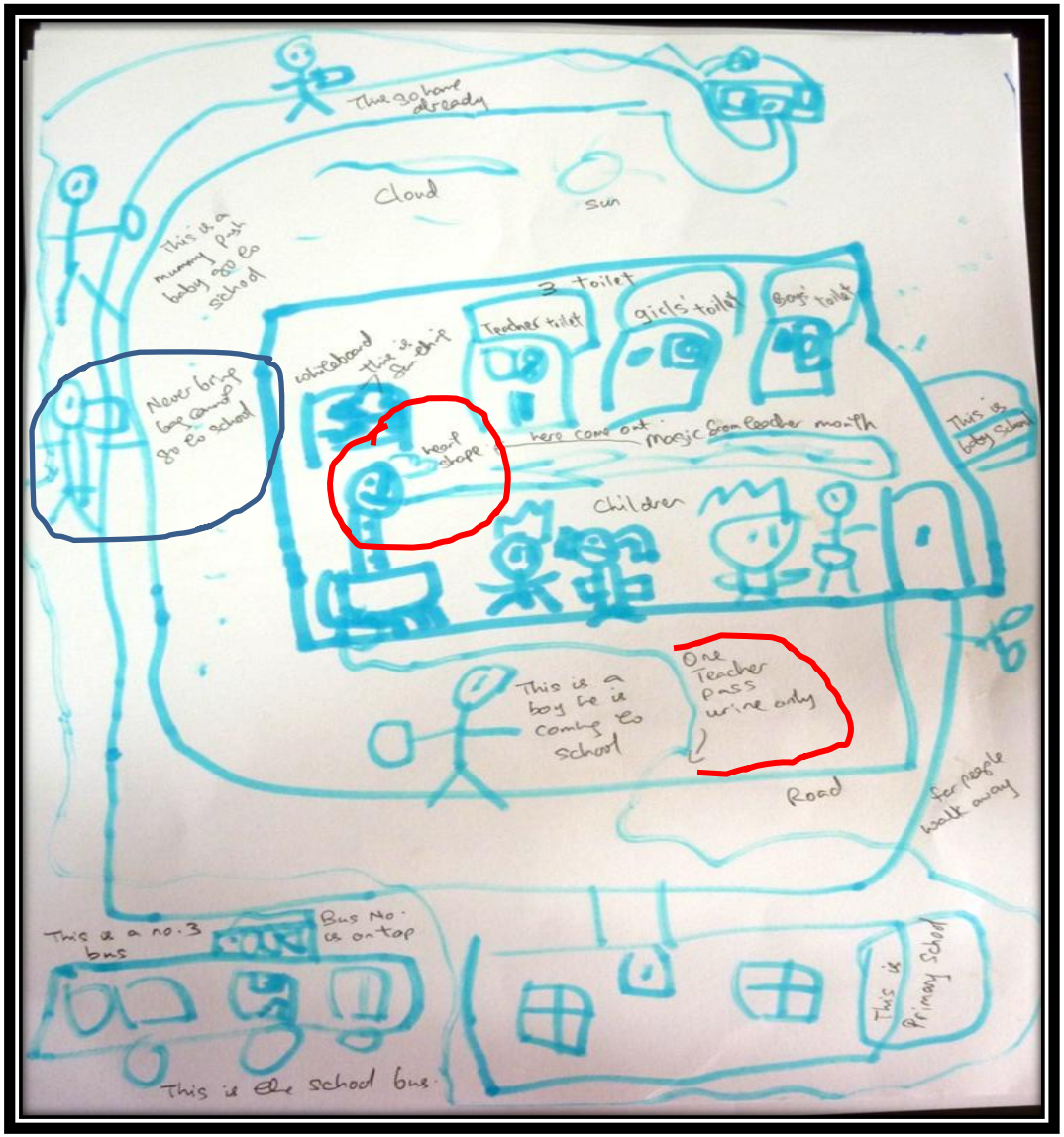
Concrete: go to school, teacher passes urine,

Abstract: love – magic come out from teacher's mouth

4. ANALYZE

Differentiating by selecting relevant from irrelevant parts & Organizing people by finding coherence and structuring:

Going to school & within school activities



Number story
Drawing D2 Praise D2

1. REMEMBER

Able to identify and label the names of things

- flowers & words

2. UNDERSTAND

Classify *by organising and categorizing THINGS according to functions / purposes*

- *flowers, & words*

Interpret by giving examples

- words flow from left to right

4. ANALYZE

- ***Differentiating*** *things by distinguishing / selecting relevant from irrelevant parts of the presented material*
- *differentiate flowers from words*

6 Cognitive Processes

3. **APPLY – HOW/WHERE**

- Execute a procedure to find out how elements are involved in the process
- Where things come from and go?
- What's the outcome of this coming & going e.g. water cycle; womb/baby; flower cycle

Things in a classroom
D1 W.

1. REMEMBER

Able to identify and label the names of THINGS represented:

•Road, grass, bulldozer, cement truck, construction

2. UNDERSTAND

***Interpret* by giving examples &**

***Classify* by organising and categorizing people according to functions / occupations:**

•*Trucks ~workers ~ roads*

3. APPLY

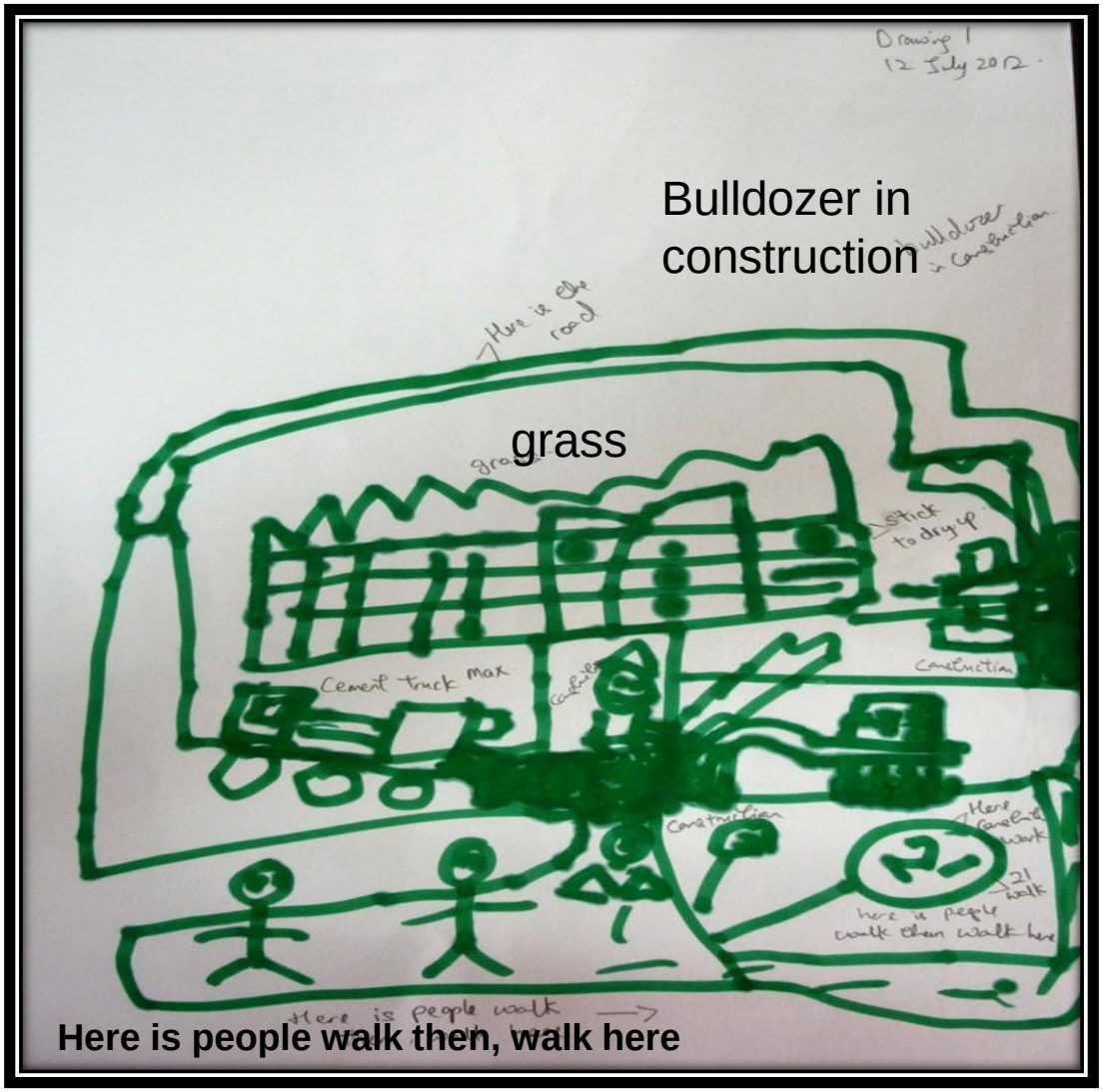
People come from and where it goes in the process.

• "people walk then- walk here"

4. ANALYZE

***Differentiating* by selecting relevant from irrelevant parts & *Organizing* people by finding coherence and structuring:**

• A construction scenario



Here is people walk then, walk here

6 Cognitive Processes

4. **ANALYZE – WHY/HOW**

- Differentiating by distinguishing/select relevant from irrelevant
- Discriminating
- Distinguishing
- Focusing
- selecting

- Organizing – many parts make one whole structure e.g. birthday party theme drawing
- Attribute – to consider as by determining a view, bias, value

Things in a classroom
D1 Z.

1. REMEMBER

Able to identify and label the names of THINGS represented:

•My Clock, window, my cup

4. ANALYZE

Differentiating by selecting relevant from irrelevant parts

• clocks & numbers

•Window & curtain

What I like to do in school
D2 S.

1. REMEMBER

Able to identify and label the names of THINGS represented.

• roof, window, spelling; worm home (swiggle marks), carparks

2. UNDERSTAND

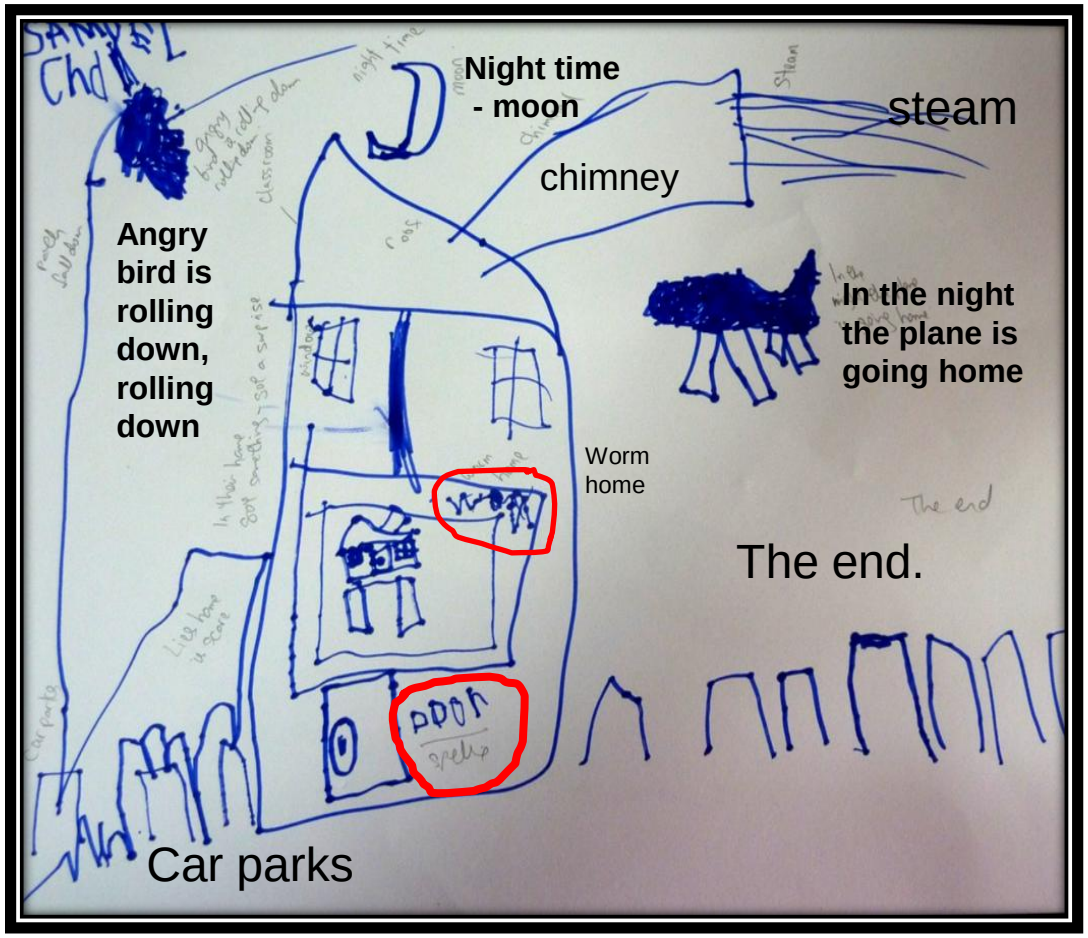
Interpret by giving examples

•night time~moon; in the night the plane is going home; chimney~steam; “the end”

3. APPLY

People come from and where it goes in the process.

•Angry bird is rolling down (pathway)



National Day
D1 B

1. REMEMBER

Able to identify and label the names of THINGS represented:

• *fireworks, chair, table (table legs & table cloth 'blanket');*

• *Birthday day ~Decoration (moon & star; candle blow)*

• ***"I wish I have a ball stick "***

2. UNDERSTAND

•***Classify*** *by organising and categorizing THINGS according to functions / purposes*

• *cake on table; cake & candle; table & chairs,*

•***Interpret*** *by giving examples*

How THINGS function or associate with something else

•*cake & 'candle can blow'*

4. ANALYZE

•***Differentiating*** ***& Organizing*** *things by selecting relevant from irrelevant parts into a theme*

• National Day: cake, fireworks

•Child interested: parts & whole (attentive to details)

What I like to do in school
D1 S.K.

1. REMEMBER

Able to identify and label the names of THINGS represented.

- ***"I like drawing angry birds in school"***
- Red, blue, white, yellow birds; eggs in the nest; Pigs – helmet pig, King pig, cute pig – pigs stole the eggs"

2. UNDERSTAND

Interpret by giving examples

- Birds ~eggs, nest; King~ (crown) majesty; helmet

4. ANALYZE

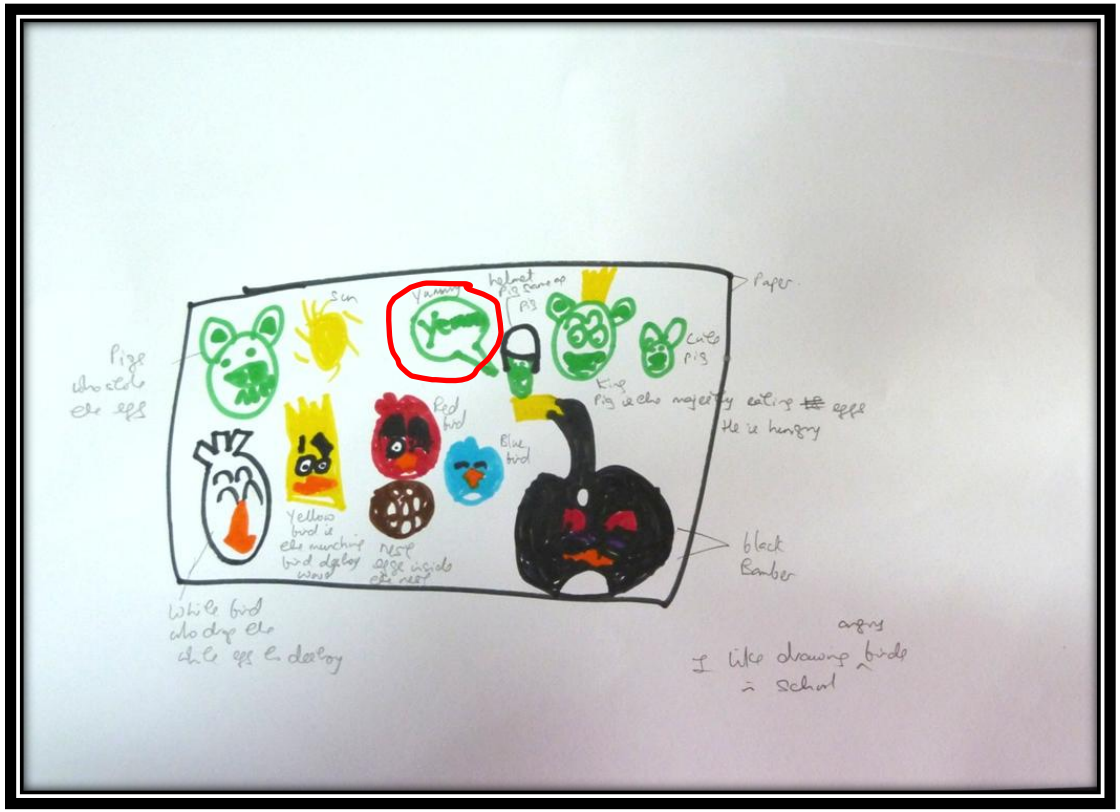
Differentiating by selecting relevant from irrelevant parts

- Birds versus pigs

6. CREATE

Produce by constructing or inventing in drawing a new model or product.

- Helmet pig (wearing a helmet),
- "King pig (wearing a crown) is the majesty eating eggs"



Number story
D2 T

1. REMEMBER

Able to identify and label the names of things

- 7 lollipops & 3 balls

2. UNDERSTAND

Classify *by organising and categorizing THINGS according to functions / purposes*

- *lollipops & balls separate groupings*

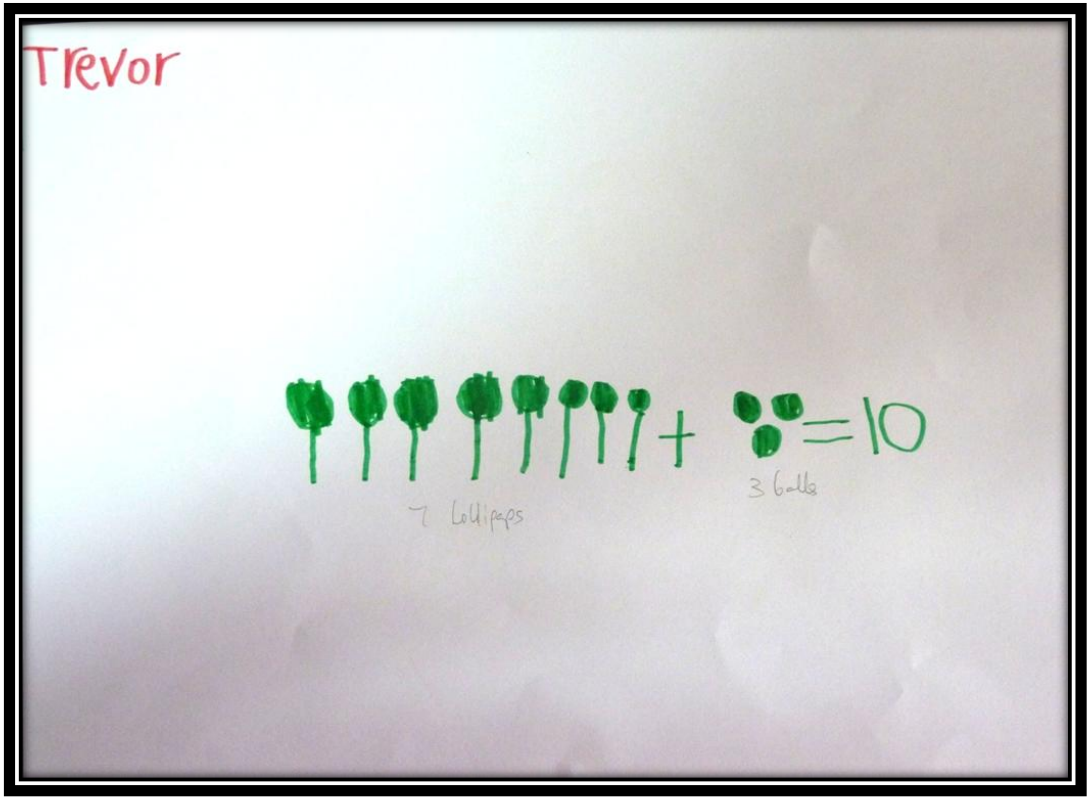
Interpret by giving examples

- one-to-one correspondence, pictures & numerals

4. ANALYZE

- ***Differentiating*** *things by distinguishing / selecting relevant from irrelevant parts of the presented material*
- *differentiate lollipops from balls.*

- ***Organizing*** *things by finding coherence and structuring how elements fit or function within a structure*
- *number story*



How do you come to school everyday
D1 L

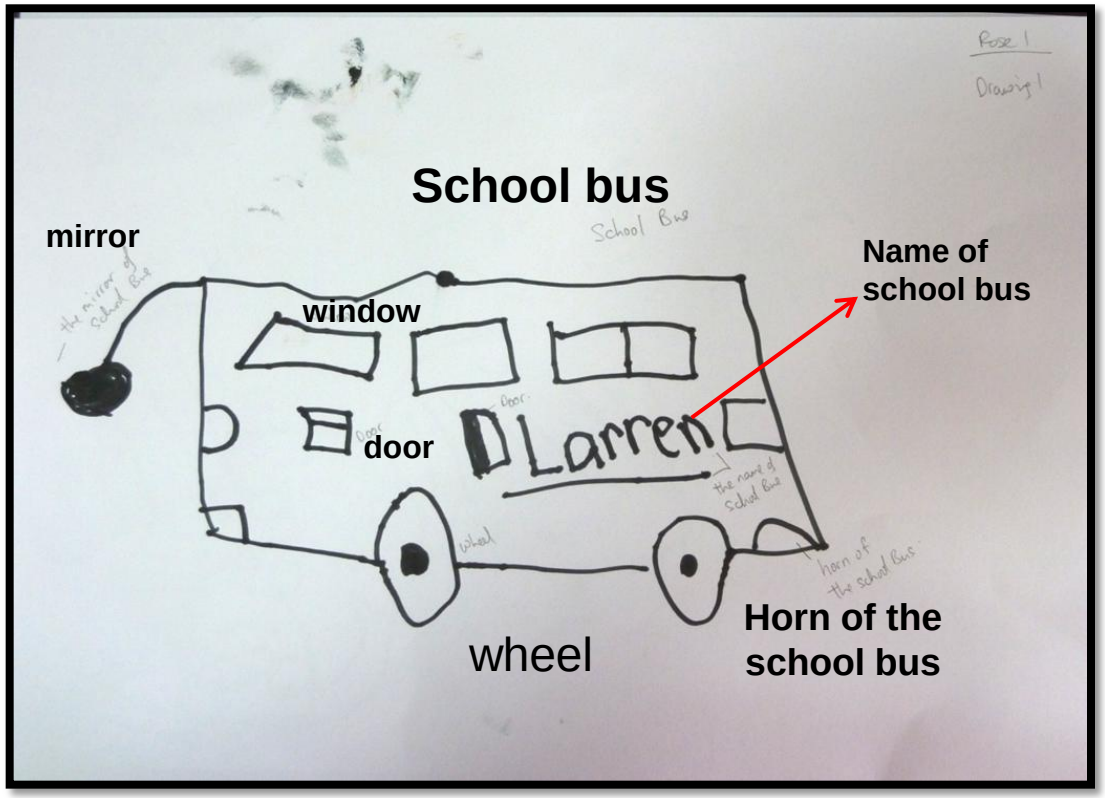
1. REMEMBER

Able to identify and label the names of THINGS represented.

- school Bus & parts

4. ANALYZE

- ***Differentiating*** *things by distinguishing / selecting relevant from irrelevant parts of the presented material*
- ***Organizing*** *things by finding coherence and structuring how elements fit or function within a structure*
- parts of a school bus – rear mirror, wheel, window, horn, door



6 Cognitive Processes

5. **EVALUATE**

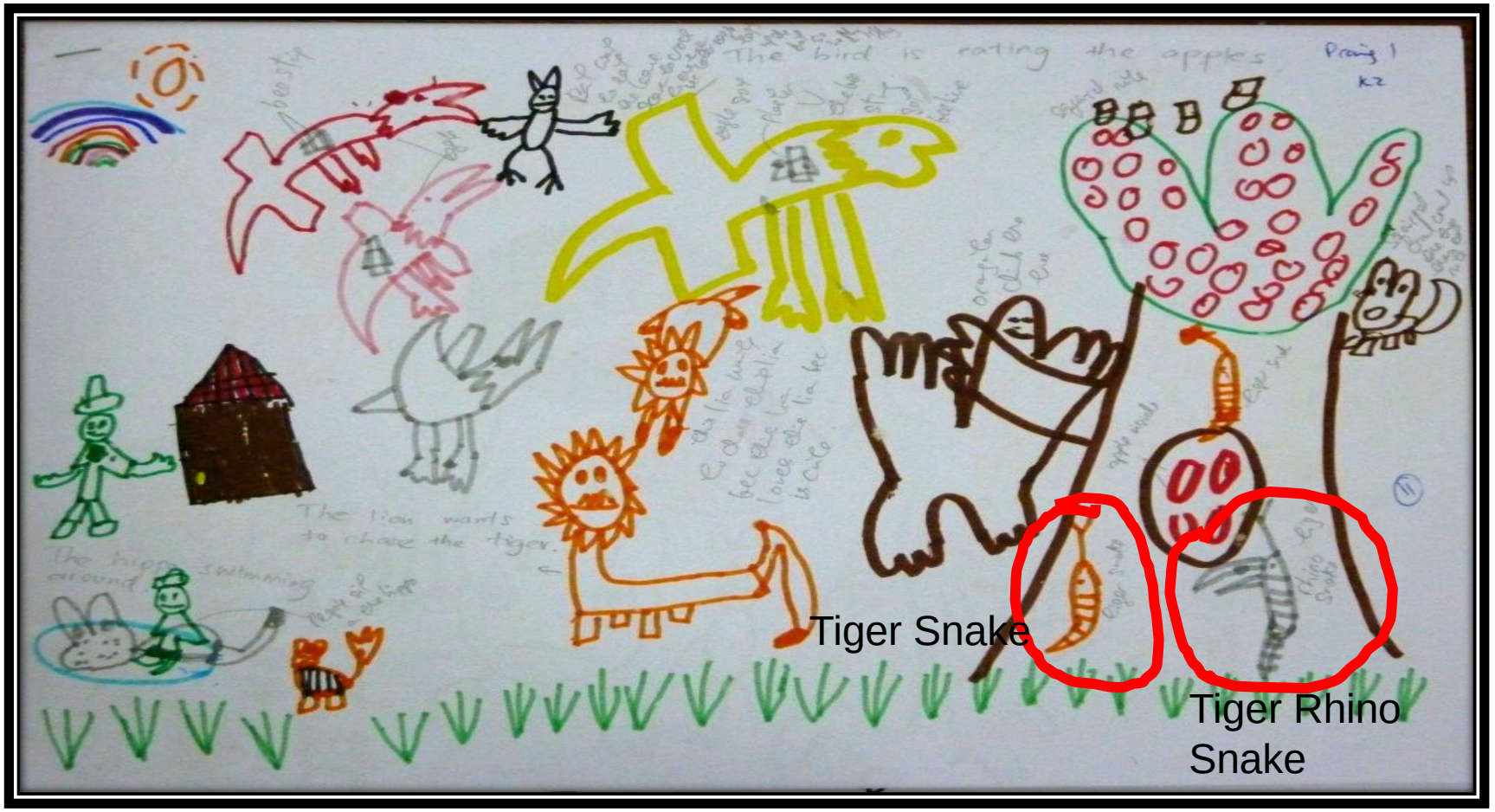
- Judge by checking criteria & standards
- Coordinating, Detecting, Monitoring, Testing
- Is it logical/illogical?
- Consistency/inconsistency?
- Accurate/inaccurate?


Rainforest
The parrots are hungry.
The baby parrot eats the diaper.
The eagle has a plaster on its body.
The butterfly is shining.
The tiger is very angry because there is no food to eat.
The girl is crying because there are no apples.
pond.

6 Cognitive Processes

6. **CREATE**

- Generating by coming up with alternative hypotheses
- Planning by designing a procedure
- Producing by constructing/inventing


The bird is eating the apples
The lion wants to chase the tiger.
Tiger Snake
Tiger Rhino Snake

from: Bob Levine <robertle@csufresno.edu>
to: Rebecca Chan <drawrebecca@gmail.com>
date: Sat, Dec 15, 2012 at 4:31 AM
subject: Your research
mailed-by: csufresno.edu
: Important mainly because of the words in the message.

Your research

Inbox x

Bob Levine Dec 15 2012 (5 days ago)

to me

Dear Rebecca,
I wanted to let you know how much I enjoyed your talk about your children's drawings project. I was impressed on many levels--everything from the project itself to your communication skills as a presenter. Please continue to keep me informed about your work. You have a wonderful future.
Regards,
Bob Levine

Robert Levine
Fall, 2012: Institute of Advanced Study, Durham University, UK
Professor of Psychology, California State University, Fresno
President, Western Psychological Association
Website: www.boblevine.net

from: Croft, Claire <Claire.Croft@durham.ac.uk>
to: "DUDGEON A.P." <a.p.dudgeon@durham.ac.uk>, "CHAN K.C.R." <r.k.c.chan@durham.ac.uk>
cc: drawrebecca@gmail.com, "FRENCH J.A." <jack.french@durham.ac.uk>
date: Fri, Nov 23, 2012 at 11:36 PM
subject: RE: Postgraduat talks Inquiry
mailed-by: durham.ac.uk

Hi Rebecca

Many thanks for getting in touch. The event will take place a week on Monday, 3rd December. We begin the evening with drinks in the SCR from 6:30, dinner is served at 7, and the talks then take place afterwards from 8pm. The evening should be finished by around 9:15. We're planning for each person to speak for around 15 minutes, with 5 minutes for questions at the end. Does that sound ok? We'd love to hear your talk!

Best wishes

From: Rebecca Chan [mailto:drawrebecca@gmail.com]
Sent: 26 November 2012 11:33
To: Croft, Claire
Cc: DUDGEON A.P.; CHAN K.C.R.; FRENCH J.A.; BROWNLOW E.K.E.

Subject: Re: Postgraduat talks Inquiry

Hi Claire,

I would like to confirm my presentation on 3 Dec 2012.
I wonder how many people are presenting?

If I could have slightly more than 15 mins would be great too -

My research title:
'Can information in children's drawings inform teachers' practices?
A survey of Singaporean pre-school teachers' 'reading' of 5-6 years olds' drawings.

Thanks.
Best wishes,
Rebecca
On Tue, Nov 27, 2012 at 12:29 PM, Croft, Claire <Claire.Croft@durham.ac.uk> wrote:

Hi Rebecca

Many thanks for this – sounds great! There are two other speakers as well, so we could stretch to a little more than 15 minutes, but not too much more I'm afraid. Hope that's ok?

Many thanks

Claire

MEDIA INVITE

Media Round-Table Discussion with Early Childhood Development Experts

Early childhood education and development is in the spotlight after recent studies revealed that Singapore ranked just 29th out of 45 countries when it comes to the quality of pre-school education. This has raised concerns among parents and the pre-school sector which triggered Prime Minister Lee Hsien Loong to address the issue at the recent National Day Rally.

PM Lee reiterated the importance of good pre-school education and the need to substantially raise quality of pre-school education for children. He also encouraged parents let their pre-schoolers to learn through play, which is exactly CBeebies' ethos.

In conjunction with Mister Maker's visit to Singapore, BBC Worldwide Channels and CBeebies would like to extend an exclusive invite for you to join us in a media round-table session to discuss issues pertinent to this area. Together with Nic Ayling, a founding producer of Mister Maker, experts who specialise in children development and celebrity parents will also be sharing insights on the changing times in early childhood development.

Session details:

Date: 14 September 2012, Friday
Time: 11.00am – 12.30pm
Venue: Plaza Singapura, Family Lounge, Level 4

Topics of discussion:

- How do children learn through art and play? Should children learn through art and play?
- What are the implications of a childhood with no play?
- Definition of "play" – is it different in children and in adults?
- Should we 'rehabilitate' parents to allow and encourage 'play' in childhood?
- Modern families – is 'no time' an excuse? How do we encourage our children to play and learn in a time-pressed society?
- Are we allowing enough room to play and be creative in Singapore's education system?

Panelists:

- Ms. Rebecca Chan, Adjunct Lecturer at SEED Institute, with Masters and PhD certification focusing on arts and early childhood education
- Ms, Leanne Sunarya, Pre-School Director of EtonHouse (Orchard Campus)
- Ms. Katy Harris, Social/behavioral therapist from Kaleidoscope Therapy Centre
- Mr. Nic Ayling, Producer, Mister Maker Make It Show
- Ms. Anna Belle Francis, Artiste and mother of two
- Ms. Jamie Yeo, Artiste and mother of one

Please RSVP by **12 September (Wednesday)** to the following contacts if you're interested to attend the session:

Katherine Kee
Fulford PR
6324 2284
kkee@fulfordpr.com

Ho Shu Fen
Fulford PR
6324 5289
sfho@fulfordpr.com

About Mister Maker

Mister Maker is a real life character who gets inspiration to make art from everything around him. Set in his own fantasy art room that he has created, prepare to expect the unexpected as pictures, objects and things that he has made come to life.

Do you want to know how to make a permanent sandcastle? Or how to make alien eyes in under a minute? Mister Maker shows you all this and more in each episode, firing up the imagination and creativity of young viewers.

Mister Maker (series three) airs every day at 7.30am, 11.30am, 3.30pm and 7.30pm from Saturday, 1 September 2012; ***Mister Maker Comes to Town*** (series one) airs every day at 7.50am, 11.50am, 3.50pm and 7.50am from Monday, 3 September 2012; and ***Mister Maker Comes to Town*** (series two) premieres first and exclusively from Saturday, 13 October 2012 at 7.30am and 3.30pm, only on CBeebies (StarHub Channel 303).

About CBeebies

CBeebies, the number one pre-school channel in the UK provides a high-quality, interactive, entertaining and educational experience for pre-school children, offering them a safe haven in which to learn about, and enjoy, the world around them. CBeebies offers internationally-acclaimed and award-winning household favourites such as *Teletubbies, In the Night Garden* and *Charlie & Lola.*

Programmes on the channel emphasise educational entertainment and are supported by the core BBC values, ensuring they are trustworthy, reliable and informative. CBeebies provides a safe, non-violent environment for the channel's viewers.

In Singapore you can catch CBeebies on StarHub Channel 303. For more information, visit www.CBeebies.com

MCYS Child Care Seminar 2011, Sep, 29 Evaluation Report

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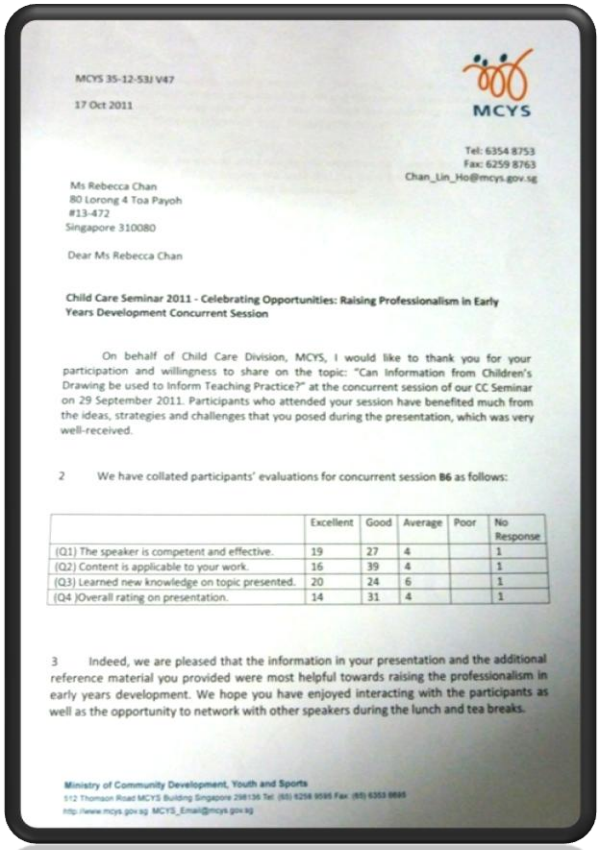

MCYS 35-12-53J V47

17 Oct 2011

MCYS

Tel: 6354 8753
Fax: 6259 8763
Chan_Lin_Ho@mcys.gov.sg

Ms Rebecca Chan
80 Lorong 4 Toa Payoh
#13-472
Singapore 310080

Dear Ms Rebecca Chan

Child Care Seminar 2011 - Celebrating Opportunities: Raising Professionalism in Early Years Development Concurrent Session

On behalf of Child Care Division, MCYS, I would like to thank you for your participation and willingness to share on the topic: "Can Information from Children's Drawing be used to Inform Teaching Practice?" at the concurrent session of our CC Seminar on 29 September 2011. Participants who attended your session have benefited much from the ideas, strategies and challenges that you posed during the presentation, which was very well-received.

2 We have collated participants' evaluations for concurrent session **B6** as follows:

	Excellent	Good	Average	Poor	No Response
(Q1) The speaker is competent and effective.	19	27	4		1
(Q2) Content is applicable to your work.	16	39	4		1
(Q3) Learned new knowledge on topic presented.	20	24	6		1
(Q4)Overall rating on presentation.	14	31	4		1

3 Indeed, we are pleased that the information in your presentation and the additional reference material you provided were most helpful towards raising the professionalism in early years development. We hope you have enjoyed interacting with the participants as well as the opportunity to network with other speakers during the lunch and tea breaks.

Ministry of Community Development, Youth and Sports
512 Thomson Road MCYS Building Singapore 298136 Tel: (65) 6254 9595 Fax: (65) 6353 8885
http://www.mcys.gov.sg MCYS_Email@mcys.gov.sg

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4 We look forward to working with you to further develop and engage the early childhood community in their professional learning and development in our future seminars. Please do not hesitate to provide us with your feedback and suggestions on how the CCS can be further improved (My email: chan_lin_ho@mcys.gov.sg).

5 Once again, we want to acknowledge your contributions towards making this year's Child Care Seminar 2011 a success. We hope that the small token presented to you will convey our appreciation of your support and participation.

Best Wishes

Dr Chan Lin Ho
Deputy Director
Policy & Development
Child Care Division
Ministry of Community Development, Youth and Sports

Cambridge Parents' Feedback on Rating Water Cycle (18 Parents & 7 Teachers)			
No	**Name**	**Strengths**	**Weakness**
1	Anonymous	*Rebecca is able to give useful examples for her explanation.* *She has a passion on what she's doing currently and this really helps to make the session lively & meaningful*	
2	Denise	*The workshop has been a great help in understanding my kid's drawings. The stages and thinking process explained becomes meaningful and helps me to appreciate my kid's drawing better. Thank you for the great insights! Cheers, Denise*	
3	Anonymous	*I have learnt not to restrict my child from drawing. I have also learn that from drawing my child learn. It is a valuable workshop that I would also recommend to my friends. Thanks for the workshop*	
4	Anonymous	*The session has been insightful but would have been better if thre are pointers for parents to look out for in our kid's drawings* *The session is informative and useful. Perhaps too technical and too much detail for parents, probably the right detail level for teachers.* *A higher level and summary for parent would perhaps be more appropriate*	
5	Anonymous	*It's really good for me cause can learn what my son think through what he draw. So that next time I'll more concern about it*	
6	Alice Phua	*I think this session is very informative and I think all parents should attend.* *Good to point out what to look out for be it good or bad when we see their drawings. So that we know what they are thinking in terms of their emotions.* *Thanks for the session.*	*But I think the checklist is a bit heavy as we may not know all full details of analyzing.*
7	Elaine & Dennis Leu	*Through this seminar, I understand that drawing is a form of communication & expression & imagination by the child. This gives a good understanding of what the child thinks. It helps us to teach/guide the child. Thank you for the seminar.*	
8	Anonymous	*Dear Rebecca,* *I have never attended such workshop, so I believe it is very beneficial for parents with young children. Will definitely recommend other parents for such workshop in future.* *Cheers, Kathy*	

Parents' feedbacks on the Bloom's TEO drawing evaluation checklist **Appendix I4**

MCYS Email Correspondence on Male-teacher Population **Appendix I5**

from: Siok Kheng (Mrs Wong) YEO (MCYS) <YEO_Siok_Kheng@mcys.gov.sg>
to: Rebecca Chan <drawrebecca@gmail.com>
date: Wed, May 18, 2011 at 8:47 PM

Dear Rebecca

This information, "Out of more than 5,600 childcare teachers, only 26 are men, orless than 0.5 per cent of the total number" has been released to the media recently. You may wish to use this in your PhD paper…

Thanks,

Jenny

Jenny Wong-Yeo Siok Kheng (Mrs), Assistant Manager, Professional Development / Child Care Division, Ministry of Community Development, Youth and Sports | DID: (65) 6354 9525 | Fax: (65) 6259 8763 | Website: www.mcys.gov.sg

Bibliography

Abruscato, J. (2004) *Teaching Children Science: A Discovery Approach* (6th Ed.). Allyn & Bacon.

American Psychological Association (2010) *Concise rules of APA style* (6th Ed.) United Book Press, Baltimore, MD.

Anderson, L. W. (2002) Curricular Alignment: A Re-Examination. Theory into Practice, 41(4), *Revising Bloom's taxonomy* (Autumn), pp.255-260. Taylor & Francis. Retrieved from http://www.jstor.org/stable/1477405

Arheim, R. (2004) *Visual thinking* (35 Anv edition). University of California Press.

Bassey, M. (1999) *Case study research in educational settings*. Buckingham: Open University Press.

Bertocci, P. A. (1980) A personalistic philosophy of education. In Sloan, D. (Ed) *Education and Values.* Teachers College, Columbia University; New York and London

Biggs, J. B. (1995) Assessing for learning: some dimensions underlying new approaches to educational assessment. *Alberta Journal of Educational Research*, 41(1), pp.1-17.

Bohm, D. (1980) On insight and its significance, for science, education, and values. In Sloan, D. (Ed) *Education and Values,* Teachers College, Columbia University; New York and London.

Bransford, J. D. & Vye, N. J. (1989) A perspective on cognitive research and its implications for instruction. In Resnick, L. B. & Klopfer, L. E. (Eds.) *Toward the thinking curriculum: current cognitive research.* The Association for Supervision and Curriculum Development.

Broadfoot, P. & Black. P. (2004) Redefining assessment? The first ten years of assessment in education. *Assessment in Education: Principles, Policy & Practice* 11(1) pp. 7-26. Routledge. doi:10.1080/0969594042000208976

Broudy, H. (1980) Tacit Knowing as a Rationale for Liberal Education. In Sloan, D. (Ed.) *Education and Values*, Teachers College, Columbia University; New York and London

Brown, A. (1987) Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In Weinert, F. E. & Kluwe, R. H. (Eds.) *Metacognition, motivation, and understanding,* Lawrence Erlbaum Associates.

Bruner, J. (1977) *The process of education* (1st Ed). Harvard University Press.

Calderhead, J. (1996b) Teachers: beliefs and knowledge. In Berliner, D. C. and Calfee, R. C. (Eds.) *Handbook of educational psychology*. New York: Prentice Hall.

Carley, K. & Palmquist, M. (1992) *Extracting, Representing, and Analyzing Mental Models Social Forces*, March 70(3) pp.601-636. The University of North Carolina Press. Retrieved from http://www.jstor.org/stable/2579746 .

Chan, R. (2000): *Children's representational strategies in drawing* (Unpublished Master's thesis). Goldsmiths College, London, UK.

Clark, I. L. (2007) *Writing the successful thesis and dissertation: entering the conversation*. Pearson Education.

Copple, C. & Bredekamp, S. (2009) *Developmentally Appropriate Practice (in Early Childhood Programs, Serving Children from Birth through Age 8)* (3rd Ed.) National Association for the Education of Young Children.

Creswell, J. W. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd Ed.). SAGE Publications.

Donaldson, M. (1978) *Children's minds*. Fontana Press.

Driver, R., Guesne, E. & Tiberghien, A. (Ed.) (1985) Children's ideas and the learning of science. In Driver, R.; Guesne, E. & Tiberghien, A. (Eds.) *Children's ideas in science*. Open University Press, England.

Dunlop, F. (1996) Democratic Values and the Foundations of Political Education. In Halstead, J. M. & Taylor, M. J. (Eds.) *Values in education and education in values*. Routledge, New York.

Fischer, K. W. & Silvern, L. (1985) Stages and individual differences in cognitive development. *Annual Review of Psychology*, 36 pp. 613- 648. Retrieved from http://www.annualreviews.org.ezphost.dur.ac.uk/doi/pdf/10.1146/annurev.ps.36.020185.003145

Glauert, E.B. (2009) How Young Children Understand Electric Circuits: Prediction, Explanation and Exploration. *International Journal of Science Education*, 31(8), 15 May, pp. 1025–1047. Taylor & Francis. doi: 10.1080/09500690802101950

Golomb, C. (2004) *The child's creation of a pictorial world* (2nd Ed.) Mahwah, NJ: Lawrence Erlbaum

Guba, E, G. and Lincoln, Y. S (2008) Paradigmatic Controversies, Contradictions, and Emerging Confluences. In Denzin, N. K and Lincoln, Y.S., *The Landscape of Qualitative Research* (Eds.) (3rd Ed). Sage Publication.

Halstead, J. M. & Taylor, M. J. (1996) Values and values education in schools. In Halstead, J. M. & Taylor, M. J. (Eds) *Values in education and education in values*. Routledge, New York.

Harrison, L. J.; Clarke, L.; Ungerer, J. A. (2007) Children's drawings provide a new perspective on teacher-child relationship quality and school adjustment. *Early childhood research quarterly* 22 pp. 55-71. doi:10.1016/j.ecresq.2006.10.003

Herbert, J. (1969) A system for analysing lessons. Review by Westbury, I.. *The School Review*, 77(2), pp. 157-163. The University of Chicago Press. Retrieved from: http://www.jstor.org/stable/1084388

Holt, B-G. (1989) *Science with young children*. National Association for the Education of Young Children (NAEYC). Washington, D.C.

Kellogg, R. (1967) *Rhoda Kellogg Child Art Collection*. Washington, DC., Microcard Editions, Handbook.

Krampen, M. (1991) *Children's drawings: iconic coding of the environment*. Plenum Press, New York.

Krathwohl, D. (2002) A revision of Bloom's taxonomy: An overview. Theory into Practice, Vol.41. No. 4, *Revising Bloom's Taxonomy* (Autumn), pp. 212-218. Taylor & Francis, Retrieved from http://www.jstor.org/stable/1477405

Linfield, R. S., and Warwick, P. (2003) "Is it like the school bus?" Assessment in the early years. In Whitebread, D. (ed) *Teaching and learning in the early years* (2nd ed). RoutledgeFalmer.

Lodge, C. (2007) Regarding learning: Children's drawings of learning in the classroom. *Learning Enivron Res* (2007) 10:145-156. Springer.

Maloney, J. and Curtis, S. (2012) Models and analogies: using models to promote children's scientific understanding. *Primary science*, 123 (May/June). The association for science education. Retrieved from http://www.ase.org.uk/journals/primary-science/2012/05/123/3083/95-7.pdf

Matthews, J. (1994a) *Helping children to draw and pint in early childhood: children and visual representation*, 0-8 series, Series Editor Tina Bruce, Hodder & Stoughton.

Nespor, J. (1987): The role of beliefs in the practice of teaching, *Journal of Curriculum Studies,* 19(4), pp. 317-328. Routledge. doi**:**10.1080/0022027870190403

Newton, D. P. (1984) Showing movement in children's pictures: a study of the effectiveness of some non-mimetic representations of motion. *Educational Studies*, 10 (3) pp.255-261. doi**:**10.1080/0305569840100306

Newton, D. P. (2000) What do we mean by teaching for understanding? In Newton, L. D. *Meeting the standards in primary science: A guide to the ITT NC*. Routledge Falmer, London & New York.

Newton, D. (2012) Recognizing creativity. In Newton, L. (Ed.) *Creativity for a new curriculum: 5-11*. Routledge. London and New York.

Newton, L. & Newton, D. P. (1987) Art for learning's sake. *Nursery World*, January, 15, pp.8-10.

Newton, L. D. (2000) *Meeting the standards in primary science: A guide to the ITT NC*. Routledge Falmer, London & New York.

Noddings, N. (2007) *Philosophy of Education* (2nd Ed.) 2007 Westview Press

Nuffield Primary Science (1997) *Understanding science ideas: a guide for primary teachers*. Collins educational, London.

Nuttall, E. V.; Romero, I. & Kalesnik, J (eds). (1992) *Assessing and screening Preschoolers: Psychological and Educational Dimensions* (2nd Ed). Allyn & Bacon.

Pedersen, S. M. L., (2003) Teachers' beliefs about issues in the implementation of a student-centered learning environment. *Educational Technology Research & Development*, 51(2) pp. 57–76. Retrieved from http://link.springer.com.ezphost.dur.ac.uk/content/pdf/10.1007%2FBF02504526

Peter, R. S., (1980) Democratic values and educational aims. In Sloan, D. (Ed) *Education and Values.* Teachers College, Columbia University; New York and London.

Piaget, J. (1951) *Play, dreams and imitation in childhood*. Routledge and Kegan Paul.

Pinto, G., & Bombi, A. S. (2008) Children's drawing of friendship and family relationships in different cultures. In Milbrath, C. & Trautner, H. M. (Eds.), *Children's Understanding and production of pictures, drawings, and art.* Hogrefe & Huber Publishers.

Plummer, K., (2008) Critical Humanism and Queer Theory: Living with the Tensions. In Denzin, N. K and Lincoln, Y.S *The Landscape of Qualitative Research* (Editors) (3rd). Sage.

Rabago- Mingoa, T (2009) Children's drawings speak more than words. *Asia-pacific Journal of research in early childhood education.* 3(2), pp. 53-71.

Reichel, G. A. (1994) Performance Assessment: Five Practical Approaches. *Science and Children*. October, p. 21-25. Retrieved from http://www.exploratorium.edu/IFI/resources/lifescienceinquiry/usingkwl.html.

Ring, K. (2010) Supporting a playful approach to drawing. In Broadhead, P.; Howard, J. & Wood, E., (eds.) *Play and learning in the early years.* SAGE Publication, London.

Rose, S. E.; Jolley, R. P.; & Burkitt, E. (2006) A review of children's, teachers 'and parents' influences on children's drawing experience. *International Journal of Art & Design Education* 25(3) The Authors. Journal compilation. NSEAD/Blackwell Publishing . doi: 10.1111/j.1476-8070.2006.00500.x

Schussler, E. & Winslow, J. (2007) *Drawing on students' knowledge: this quick and fun assessment checks student understanding before and after studying plant life cycles*. Science and Children.

Schwab, J. J. (1973) The practical 3: Translation into curriculum. *School Review*,81(4) (Aug.), pp. 501-522. Retrieved from http://www.jstor.org/stable/1084423

Sommers, P. V. (2009) *Drawing and cognition: Descriptive and experimental studies of graphic production processes*. Cambridge University Press

Torrance, H. (2001) Assessment for learning: Developing Formative Assessment in the Classroom. *Education Three to Thirteen* (October)Taylor and Francis. Retrieved from

http://www.swetswise.com.ezphost.dur.ac.uk/FullTextProxy/swproxy?url=http%3A%2F%2Fwww.tandfonline.com%2Fdoi%2Fpdf%2F10.1080%2F03004270185200331&ts=1357107130543&cs=1052136869&userName=8085069.ipdirect&emCondId=529133&articleID=33495576&yevoID=2067321&titleID=64658&referer=2&remoteAddr=129.234.252.65&hostType=PRO&swsSessionId=QDOAMe7AmNmmRAE4-1mFiQ__.pasc1

Weinert, F. E & Kluwe, R.H. (Eds) (1987) *Metacognition, motivation, and understanding*. Lawrence Erlbaum Associations.

Wellman, H. M and Gelman, S. A. (1992) Cognitive Development: Foundational Theories of Core Domains. *Annual Review of Psychology* 42 pp.337-75. Retrieved from http://www.annualreviews.org.ezphost.dur.ac.uk/doi/pdf/10.1146/annurev.ps.43.020192.002005

Whitebread, D. (2003) Introduction: young children learning and early years teaching. In Whitebread, D. (ed) *Teaching and learning in the early years* (2nd ed). RoutledgeFalmer.

Willats, J. (2005) *Making sense of children's drawings*. Lawrence Erlbaum Associates.

Willats, J. (1997) *Art and Representation*: New Principles in the analysis of pictures, Princeton: University Press

Windschitl, M. (2002) Framing constructivism in practice as the negotiation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facing teachers. *Review of Educational Research*, 72, pp.131-175. Retrieved from http://www.jstor.org/stable/3516031

Wood, E. (2010) Developing integrated pedagogical approaches to play and learning. In Broadhead, P.; Howard, J. & Wood, E. (eds.) *Play and learning in the early years.* SAGE Publication, London.

Wright, S. (2010) *Understanding creativity in early childhood: Meaning-making and children's drawing.* SAGE Publication, London.

Yin, R. K (2003) *Case study research: Design and methods* (3rd Ed). Sage Publications.

Glossary

Analogical reasoning	A form of reasoning in which a similarity between two or more things is inferred from a known similarity between them in other respects
Children's drawings	Visual representations using marking structures to construct meanings of experiences, observations, and knowledge of the environment in 2-dimensional form i.e. papers.
Drawing 1	Pre-lesson drawing
Drawing 2	Post-lesson drawing
Evaluate	To determine by checking against a set of criteria
Framework	Is a general term for a structure that provides support as constructs for understanding thinking
Insufficient knowledge	Inadequate or lack of knowledge that stemmed from previous experiences and learning to achieve a lesson's objectives
Learning	Learning to know or the development of knowledge. A process of establishing patterns, pattern matching and making links between patterns of prior and new information encountered. Is used synonymously with knowledge and information
Learning Objectives	Are statements that describe the desired results or "ends" of the instructional process
Narrative	Verbal descriptions and explanations
New material	Novel or unfamiliar idea / knowledge / information

Prior knowledge	Knowledge children already acquired prior to formal teaching in a classroom.
Read	Is to study to understand the information encoded in children's drawings
Spontaneous knowledge	Knowledge inclusive of prior knowledge, subject matter knowledge, and knowledge far more than subject-related matter.
Taxonomy	Refers to the product of that classification of descriptive devices that do not offer causal explanations, although, they provide information that supports speculation and the construction of theories
Teach	To impart knowledge to extend learning and thinking skills
Teaching thinking	Refer to pedagogical approaches through which specific strategies and procedures may be taught and used by learners in a controlled, conscious way to make their learning more effective.
Thinking	A consciously goal-directed process, such as remembering, forming concepts, planning what to do and say, imagining situations, reasoning, solving problem, considering opinions, making decisions and judgments, and generating new perspectives also known as mental activity in this study.
Young children	Refers to 5 and 6 years old pre-schoolers

References

Ahn, J. and Filipenko, M. (2006*) Narrative, imaginary play, art, and self: intersecting worlds.* Early Childhood Education Journal, 34(4) doi: 10.1007/s10643-006-0137-4

Airasian, P. W. & Miranda, H. (2002) The role of assessment in the revised Taxonomy. *Theory into Practice*, 41(4) Revising Bloom's Taxonomy (Autumn), pp. 249 – 254. Retrieved from http://www.jstor.org/stable/1477405

Anderson, L.W., & Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., Wittrock, M. C., (2001) (eds) *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives Complete Edition*. Addison Wesley. Longman.

Arheim, R. (1969) *Art and Visual perception* (rev 4th ed.). University of California.

Askew, M., Brown, M., Rhodes, V., Wiliam, D., & Johnson, D. (1997). *Effective Teachers of Numeracy: Report of a study carried out for the Teacher Training Agency*. London: King's College, University of London.

Athey, C. (2007) *Extending the thoughts of young children*. London, SAGE Publications.

Bar, V. (1989) *Children's views about the water cycle*. Science Education, 73 (4) pp. 481-500. Salem, Mass: W.G. Whitman, 1929. doi: 10.1002/sce.3730730409

Biggs, J. (1979) Individual differences in study processes and the quality of learning outcomes. *Higher Education* 8 (1979) pp. 381-394. Elsevier Scientific Publishing Company, Amsterdam. Netherlands. Retrieved from http://www.jstor.org/stable/3446151

Biggs, J. B. & Collis, K. F. (1982) *Evaluating the quality of learning: The SOLO Taxonomy (Structure of the Observed Learning Outcome).* Academic Press. New York.

Bissell, A. N. and Lemons, P. P. (2006) A new method for assessing critical thinking in the classroom. *BioScience*, Vol. 56, No. 1, pp. 66-73. University of California Press. doi: 10.1641/0006-3568(2006)056[0066:ANMFAC]2.0.CO;2

Black, P.; McCormick, R.; James, M. & Pedder, D. (2006) Learning how to learn and assessment for learning: a theoretical inquiry. *Research papers in Education* 21(2), June, pp.119-132. Routledge. doi**:**10.1080/02671520600615547

Bloom, B. S. (1956) (ed.) *Taxonomy of educational objectives: Book 1 Cognitive domain*. Longman Group Limited, London.

Bolden, D. S. & Newton, L. D. (2008) Primary teachers' epistemological beliefs: some perceived barriers to investigative teaching in primary mathematics. *Educational Studies*, 34(5), 419-432. Routledge, London. doi**:**10.1080/03055690802287595

Boller, P. F. JR (1980) Willam James as an Educator Individualism and Democracy. In Sloan, D. (Ed.) *Education and Values.* Teachers College, Columbia University; New York and London

Resnick, L. B. & Klopfer, L. E. (Eds.) *Toward the thinking curriculum: current cognitive research.* The Association for Supervision and Curriculum Development.

Bredekamp, S. & Coople, C. (1997) *Developmentally appropriate practice in early childhood programs*. National Association for the Education of Young Children (N.A.E.Y.C)

Butler, S., Gross, J., & Hayne, H. (1995) The effect of drawing on memory performance in young children. *Developmental Psychology*, 31, pp. 597-608.

Cohen, L. & Manion, L. (1994) *Research methods in education (*4th Ed.) London: Routledge.

Coltman, P. and Whitebread, D. (2003) "My mum would pay anything for chocolate cake!" Organising the whole curriculum: Enterprise projects in the early years. In Whitebread, D. (Ed.) *Teaching and learning in the early years* (2nd ed) Routledge Falmer.

Coyne, I.T. (1997) Sampling in qualitative research. Purposeful and theoretical sampling; emerging or clear boundaries? *Journal of Advanced Nursing* 26 (3) pp. 623-630. John Wiley & Sons. Retrieved from

http://www.swetswise.com.ezphost.dur.ac.uk/FullTextProxy/swproxy?url=http%3A%2F%2Fonlinelibrary.wiley.com%2Fresolve%2Fdoi%2Fpdf%3FDOI%3D10.1046%2Fj.1365-2648.1997.t01-25-00999.x&ts=1357111068423&cs=936847096&userName=8085069.ipdirect&emCondId=529133&articleID=158671569&yevoID=3323287&titleID=110561&referer=1&remoteAddr=129.234.252.65&hostType=PRO&swsSessionId=QDOAMe7AmNmmRAE4-1mFiQ__.pasc1

Denscombe, M. (1998) *The Good Research Guide for small-scale social research projects*. Open University Press Buckingham-Philadelphia.

Driver, R., Guesne, E. & Tiberghien, A. (Eds.) (1985) Some features of children's ideas and their implications for teaching. In Driver, R.; Guesne, E. & Tiberghien, A. (Eds.) *Children's ideas in science*. Open University Press, England.

Drummond, M. J. (2003) *Assessing Children's Learning* (2nd Ed). David Fulton Publishers

Ebbeck, F. & Ebbeck, M. & Shau, S.W.K. (2010) *Reggio Emilia in practice: an approach to creativity in early childhood education*. Kendy Publishing, Hong Kong.

Edwards, J. (1996) Planning for Values Education in the school Curriculum. In Halstead, J. M. & Taylor, M. J. (Eds) *Values in education and education in values*. Routledge, New York.

Efland, A. D. (2002) *Art and Cognition: Integrating the visual arts in the curriculum*. Teachers college press, New York and National art education association.

Ertmer, P. A. (2005) Teacher pedagogical beliefs: the final frontier in our quest for technology integration? *Educational Technological Research & Development*, Vol. 53, No. 4, pp.25-39. Retrieved from http://link.springer.com.ezphost.dur.ac.uk/content/pdf/10.1007%2FBF02504683

Freeman, N. H. (1980) *Strategies of representation in young children*. Academic Press Inc. London.

Furst, E. J. (1981) Bloom's Taxonomy of Educational Objectives for the Cognitive domain: Philosophical and Educational Issues. *Review of Educational Research*; Winter, 1981, Vol. 51, No. 4, pp. 441-453. DOI:10.3102/00346543051004441

Gardner, H. (1980) *Artful scribbles: The significance of children's drawings*. Basic Book, a member of Perseus books group.

George, P. J. (2004) *Analyzing the Curriculum* (3rd Ed). McGrawHill 2004

Goodnow, J. J. (1978) Visible thinking: cognitive aspects of change in drawings. *Child Development,* 49(3) (Sep), pp.637 – 641. Wiley-Blackwell. Retrieved from http://www.jstor.org/stable/1128230

Goswami, U. (1991) Analogical reasoning: what develops? A review of research and theory. *Child Development,* 62(1) (Feb.,) pp.1-22. Blackwell Publishing on behalf of the Society for research in child development.
Retrieved from http://www.jstor.org/stable/1130701

Goswami, U. (1998) *Cognition in Children*. Psychology Press Ltd, a member of the Taylor & Francis group.

Gross, J., & Hayne, H. (1999) Drawing facilitates children's verbal reports after long delays. *Journal of Experimental Psychology: Applied*, 5, pp. 265-283

Guskey, T. R. (1986) Staff Development and the Process of Teacher Change. *Educational Researcher,* 15(5), pp. 5-12. *American Educational Research Association*. Retrieved from http://www.jstor.org/stable/1174780

Hall, E. (2010) Identity and young children's drawings: power, agency, control and transformation. In Broadhead, P.; Howard, J. & Wood, E. (eds.) *Play and learning in the early years.* SAGE Publication, London.

Harlen, W. (2006) *Teaching, learning and assessing science* 5-12 (4th Ed). SAGE, London.

Haynes, A. (2010) *The complete guide to lesson planning and preparation*. Continuum International Publishing group.

Hein, G. E. & Price, S. (1994) *Active assessment for active science: a guide for elementary school teachers.* Heinemann.

Hope, G. (2008) *Thinking and learning through drawing*. SAGE, London.

Jolley, R. P (2009) *Children and Pictures: drawing and understanding*. Blackwell.

Kendrick, M. & Mckay, R. (2004) Drawings as an alternative way of understanding young children's constructions of literacy. *Journal of Early Childhood Literacy* 4(1) pp.109-128. doi: 10.1177/1468798404041458

Kilbane, C. R., & Milman, N.B. (2005) *The digital teaching portfolio workbook: Understanding the digital teaching portfolio process.* Pearson.

Luquet, G. H. (2001) *Children's drawings (Le Dessin Enfanti)* Alan Costall (Translator). Free Association Books

Madaus, G. F.; Woods, E. M.; & Nuttall, R. (1973) A causal model analysis of Bloom's Taxonomy. *American Educational Research Journal*, 10(4), pp. 253-262. American Educational Research Association.
Retrieved from http://www.jstor.org/stable/1161657

Marton, F. (1981) Phenomenography – describing concepts of the world around us *Instructional Science,* 10 (2), pp.177-200. doi 10.1007/BF00132516

Marton, F. (1986) Phenomenography – a research approach to investigating different understandings of reality, *Journal of Thought*, 21(3), p.28 – 49. Pro Quest LLC. doi: 1749-1986-021-03-000004

Matthews, J. (1999) *The art of childhood and adolescence: the construction of meaning*. Falmer press. Taylor & Francis group, England.

Matthews, J. & Leong, J. (2002) *The art of childhood and adolescence*. National Institute of Education, Singapore.

Meade, A. & Cube, P. (2008) *Thinking children: learning about schemas*. Open University Press. England.

Milbrath, C., & Trautner, H. M. (Eds.) (2008) *Children's Understanding and production of pictures, drawings, and art.* Hogrefe & Huber Publishers.

Mindes, G. (2007) *Assessing Young Children* (3rd Ed.) Pearson Education.

Moseley, D., Baumfield, V., Elliot, J., Gregson, M., Higgins, S., Miller, J., & Newton, D. P., (2005) *Frameworks for thinking: A handbook for teaching and learning*. Cambridge University Press, New York.

Ministry of Education (2003) *Nurturing early learners: A framework for a kindergarten curriculum In Singapore*. Pre-school education unit, Ministry of education (MOE), Singapore. Retrieved from http://www.moe.gov.sg/education/preschool/files/kindergarten-curriculum-framework.pdf

Ministry of Social and Family Development (2011) *Early Years Development Framework* (EYDF) Press release Sep 29, 2011. Retrieved from http://app.msf.gov.sg/PressRoom/EarlyYearsDevelopmentFrameworkEYDF.aspx

Newton, D. P. (1985) Children's perception of pictorial metaphor. *Educational Psychology*, 5(2), pp.179-185. doi:10.1080/0144341850050207

Newton, D. P. (2012) *Teaching for understanding: what it is and how to do it* (2nd Ed.) Routledge, London & New York.

Oancea, A. (2012) Philosophy of Education. In Arthur, J., And Peterson, A. (Eds.) *The Routledge Companion to Education*. Routledge, Oxon.

Pajares, M. F. (1992) Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, Vol. 62, No. 3 pp. 307-332. American Educational Research Association. Retrieved from http://www.jstor.org/stable/1170741

Perkins, M. (2012) *Observing primary literacy*. SAGE, London.

Piaget, J., & Inhelder, B. (1967) *The child's conception of space*. Routledge & Kegan Paul, London.

Pring, R. (1971) Bloom's taxonomy: A philosophical critique (2), *Cambridge Journal of Education,* 1(2), pp. 83-91. Routledge. doi**:**10.1080/0305764710010205

Qualter, A., (1996) Finding starting points. *Differentiated primary science* (pp. 45 - 80). Open University Press. Buckingham. Philadelphia.

Robson, C. (1993) *Real world research: a resource for social scientists and practitioner-researchers.* Blackwell Publishers

Russell, T. and Watt. D (1990) *Primary space project research report* January 1990: *Evaporation and Condensation.* Liverpool University Press.

Russell, T. and Watt. D (1990) *Primary space project research report* January 1990: *Growth.* Liverpool University Press.

Saldana, J. (2009) *The Coding Manual for Qualitative Researchers*. Sage Publications Ltd.

Santrock, J. W. (2004) *Educational psychology* (2nd Ed). The McGraw-Hill Companies.

Seddon, G. M. (1978) The properties of Bloom's taxonomy of educational objectives for the cognitive domain. *Review of Educational Research,* 48(2), pp. 303-323. American Educational research Association. Retrieved from http://www.jstor.org/stable/1170087

Serdyukov, P. & Ryan, M. (2008) *Writing Effective Lesson Plans: A 5-star approach*. Pearson Education.

Smyth, J. C. (1996) Environmental Values and Education. In Halstead, J. M. & Taylor, M. J. (Eds) *Values in education and education in values*. Routledge, New York.

Sockett, H. (1971) Bloom's taxonomy: A philosophical critique (1), *Cambridge Journal of Education,* 1(1), pp. 16-25. Routledge. doi**:**10.1080/0305764710010103

Song, L., Hannafin, M. J. & Hill, J. R. (2007) Reconciling beliefs and practices in teaching and learning. *Education Technology Research & Devevelopment* 55(1), pp.27-50. doi 10.1007/s11423-006-9013-6

Soundy, C. S. And Qiu, Y. (2006/2007) Portraits of picture power: American and Chinese children explore literacy th... *Child Education;* Winter 2006/2007; 83, 2; ProQuest Education Journals.

Strauss, A.L. (1987) *Qualitative Analysis for social scientists*. Cambridge University Press.

Vygotsky, L. S. (1934/1962) *Thought and language*. In E. Hanfmann & G. Vakar, (Eds. & Trans.). Cambridge, MA: MIT Press. (Original work published 1934).

Vygotsky, L. S. (1978) *Mind in society: the development of higher psychological processes*. Cambridge, Mass; London: Harvard University Press.

Wells, G. (1986) *The meaning makers: children learning language and using language to learn.* Heinemann Educational Books, USA.

Whitebread, D. (2012) *Developmental psychology & early childhood education*. Sage.

Wood, D. (1998) *How children think and learn* (2nd Ed). Blackwell Publishers, UK.

Worthington, M. & Carruthers, E. (2003) *Children's Mathematics*. Paul Chapman Publishing.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for classroom technology innovations. *Teachers College Record,* 104, pp. 482-515